The Electrical Industry's Weekly Magazine

October 1, 1956

Electrical World

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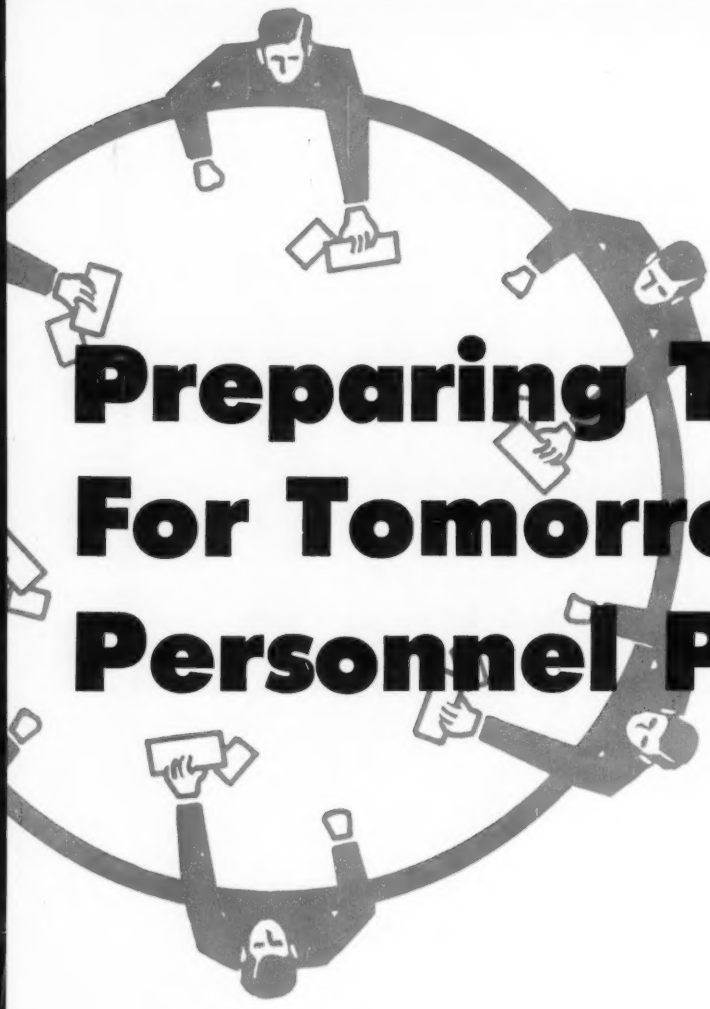

Preparing Today For Tomorrow's Personnel Problems

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Industry Charts Atomic Power Role

. . . page 50

Compare Allis-Chalmers Regulators with Others

How to Save 75% on Service

Unit Construction of Allis-Chalmers Regulators permits on-the-spot service

All that's needed is a two-man crew in a light pickup truck to set up the hydraulic jack and take care of inspection on the spot.

Inspecting other regulators usually requires moving the regulator and piecemeal untanking... using larger crews and expensive equipment. This costs 4 to 5 times more.

Unit construction means you remove only the bolts from cover and control for untanking. This simplified process can save 75% of service costs.

For complete information on these dollar-saving regulators, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5141

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ELECTRICAL WORLD

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 146, No. 14 **October 1, 1956**

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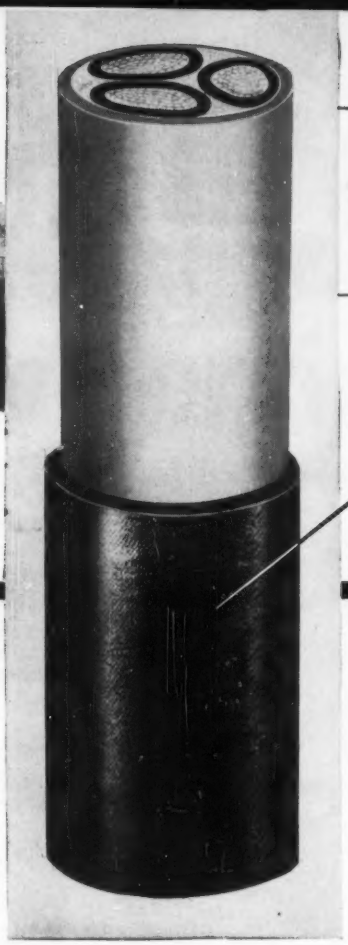
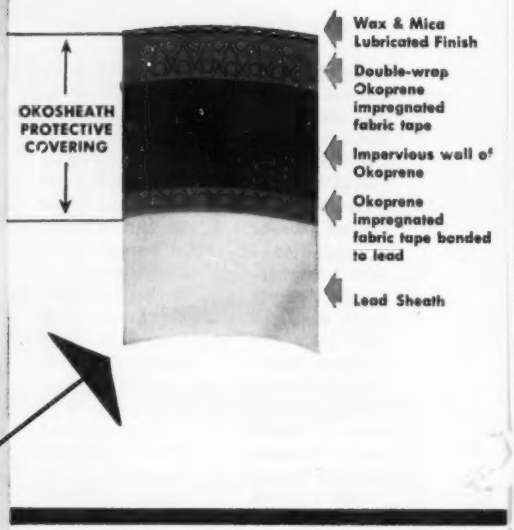
This unprotected lead sheath was scored during installation. Corrosion concentrated at the score mark and caused failure. In contrast the lead sheathed cable (at right) is covered with Okosheath Protective Covering, which prevents such mechanical injury.




OKOSHEATH PROTECTIVE COVERING
Wax & Mica Lubricated Finish
Double-wrap Okoprene impregnated fabric tape
Impervious wall of Okoprene
Okoprene impregnated fabric tape bonded to lead
Lead Sheath

Cross section of OPC shows component parts that protect lead sheath against chemical and electrolytic corrosion and mechanical damage. Since its introduction in 1933, not one case of corrosion has been reported on a lead sheath protected with Okosheath Protective Covering.

why Okosheath Protective Covering *eliminates lead sheath failure caused by scoring and corrosion*

Service records dating back to 1933 prove that Okosheath Protective Covering prolongs the life of paper-insulated lead sheathed cables for three main reasons.

1. Eliminates chemical corrosion—the substantial wall of Okoprene, free from fibrous materials that can wick-in moisture, is completely vulcanized and meets all the ASTM requirements for neoprene cable coverings. Okoprene provides excellent resistance to alkalies and acids in the soil. Firmly bonded by vulcanization to the sheath, it prevents any corrosive elements from contacting the lead and causing corrosion.

2. Stops electrolytic damage—the dense, homogeneous wall of Okoprene possesses stable electrical insulating properties which prevent electrolysis caused by stray currents. It is applied by Okonite's well-known strip-insulating process which assures a uniform wall thickness with no thin spots over the lead sheath.

3. Prevents scoring of lead—because unprotected lead sheathed cable is vulnerable to scoring from abrasion during installation, its ability to resist internal pressure is greatly reduced. In tests, lead pipe sections having controlled score marks of 10% and 15% of their average thickness and subjected to internal pressure broke 17% and 31% sooner, respectively, than unscored pipes of identical thickness. The composite reinforced wall of Okosheath Protective Covering eliminates this possibility of mechanical damage to the lead sheath. In addition, pulling problems are reduced because the two outer layers of heavy fabric tape are slushed with a wax and mica finish.

For additional information on Okosheath Protective Covering write for Bulletin EW-1047.
Address: The Okonite Company, Passaic, N. J.

available with either copper or aluminum conductors

3912

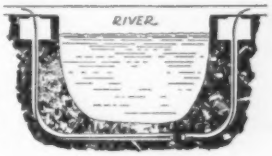
OKONITE SINCE 1878 ***insulated cables***

10,000 FEET OF CONDUIT RODDED IN 8 HOURS!

Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.



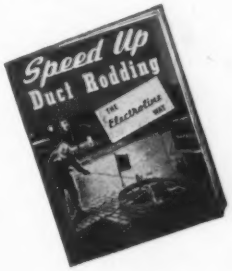
EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

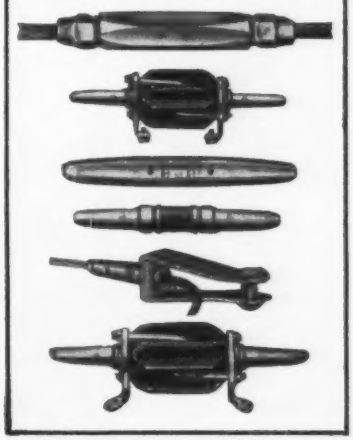
- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.



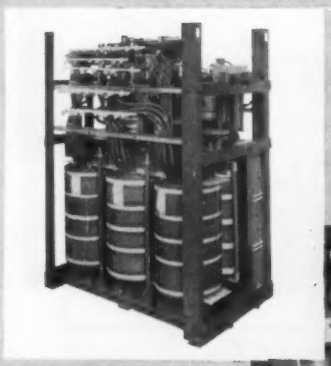
OTHER *Electroline* PRODUCTS



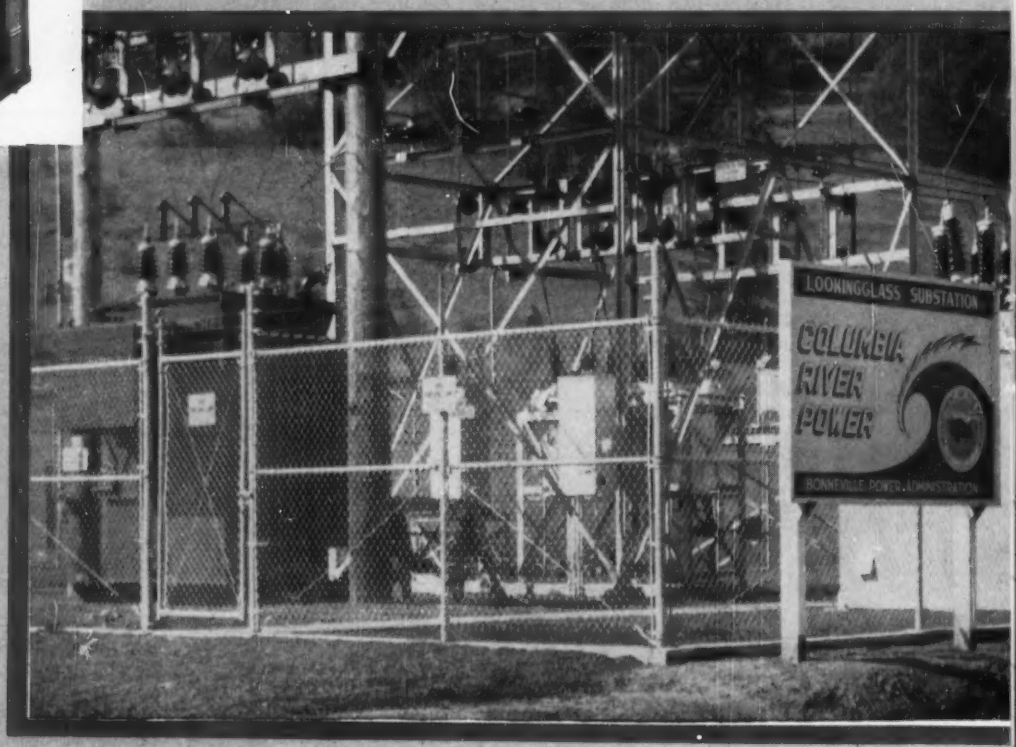
Electroline Company

4121 South La Salle St., Chicago 9, Ill.
In Canada: POWERLITE DEVICES, LTD., TORONTO

If Alice passed through LOOKINGGLASS tonight...

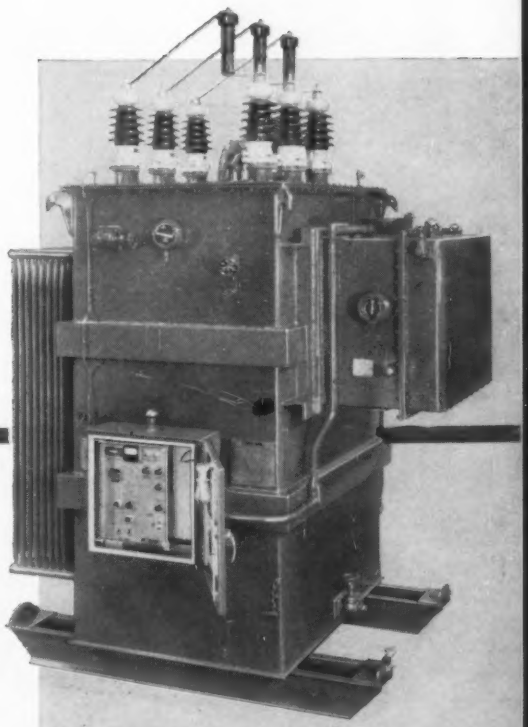


This internal view of the 750-kva Pennsylvania Step Voltage Regulator shows the exciting transformer, in the foreground, and one coil of the series transformer. Note the rigid supports of the LTC tap leads, and the rugged framework which permits the entire internal assembly to be handled as an integral unit.



..her way would be lighted with uniform voltage supplied by this 750 kva

Pennsylvania Step Voltage Regulator



With this 750-kva Pennsylvania Step Voltage Regulator, the Bonneville Power Administration (U. S. Department of Interior) maintains an even flow of voltage for the Douglas Electric Cooperative, Inc., which serves the Lookingglass Valley and adjacent areas. The unit provides 34,500 volts at a rated current of 125.5 amperes. It is equipped with an automatic load tap changer for plus or minus 10% voltage regulation in thirty-two ⅝% steps. (Three phase, 60 cycles, 55°C. rise, OA-outdoors.)

If Alice were to pass through Lookingglass tonight, she would see that many changes have been made since her famous nineteenth century trip to the land of topsy-turvy. One particularly marvelous sight would be found just about everywhere: in the streets, in homes, in stores, in barns.

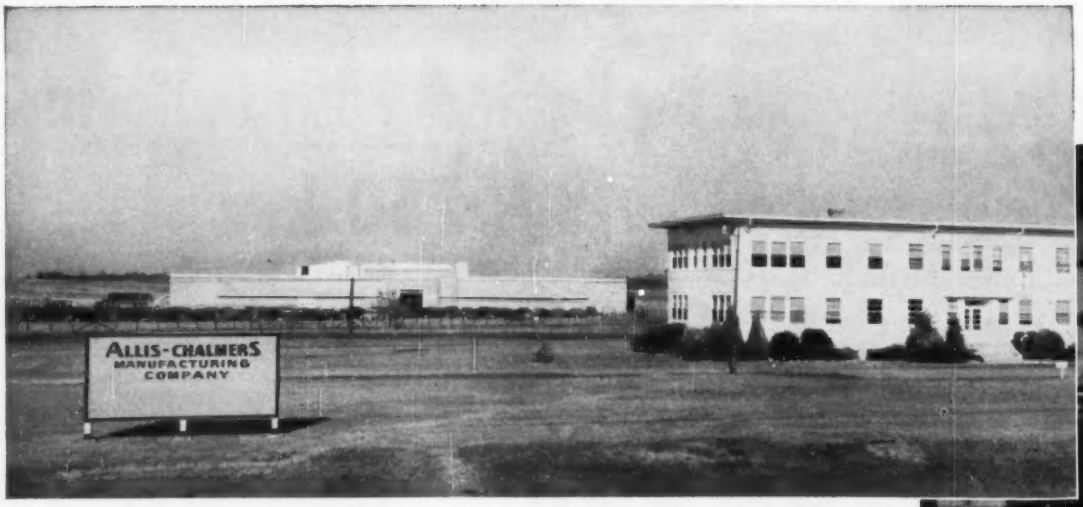
That marvel would be the steady, never-flickering glow of light produced by *well regulated* electricity. In the town of Lookingglass, Oregon — so named, in 1846, because the reflection of the sun in the green grass of the valley created a mirror-like impression — a 750-kva Pennsylvania Step Voltage Regulator is used to maintain an even voltage throughout varying load conditions. As a result, residents of the picturesque valley can enjoy to the fullest extent *any simultaneous combination* of lights, appliances, and other electrical marvels. Alice could toy and experiment all she wanted to with present day electrical curiosities — even during the peak load hours of the day.

Similar Pennsylvania Step Voltage Regulators are performing identical jobs in many communities throughout the United States — helping to transform this country into an electrical Wonderland from coast to coast.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

Large-Scale Transformer at Allis-Chalmers



Plenty of room for expansion at the Gadsden, Alabama facilities.

INCREASED production of pole-type distribution transformers at Allis-Chalmers Gadsden (Ala.) Works is good news to southern electric utilities. Now, this new plant puts every transformer user in the Southeast and Southwest within close shipping distance. By keeping Allis-Chalmers warehouses well stocked, Gadsden Works helps shorten supply lines to speed deliveries.

Allis-Chalmers Gadsden and Pittsburgh Works are teamed together to meet the increasing demand for quality controlled distribution transformers.

A-C Expansion Elsewhere

In addition to the new operations at Gadsden, Allis-Chalmers is now increasing facilities for the manufacture of electrical equipment in Pittsburgh, Boston, Terre Haute and Milwaukee.

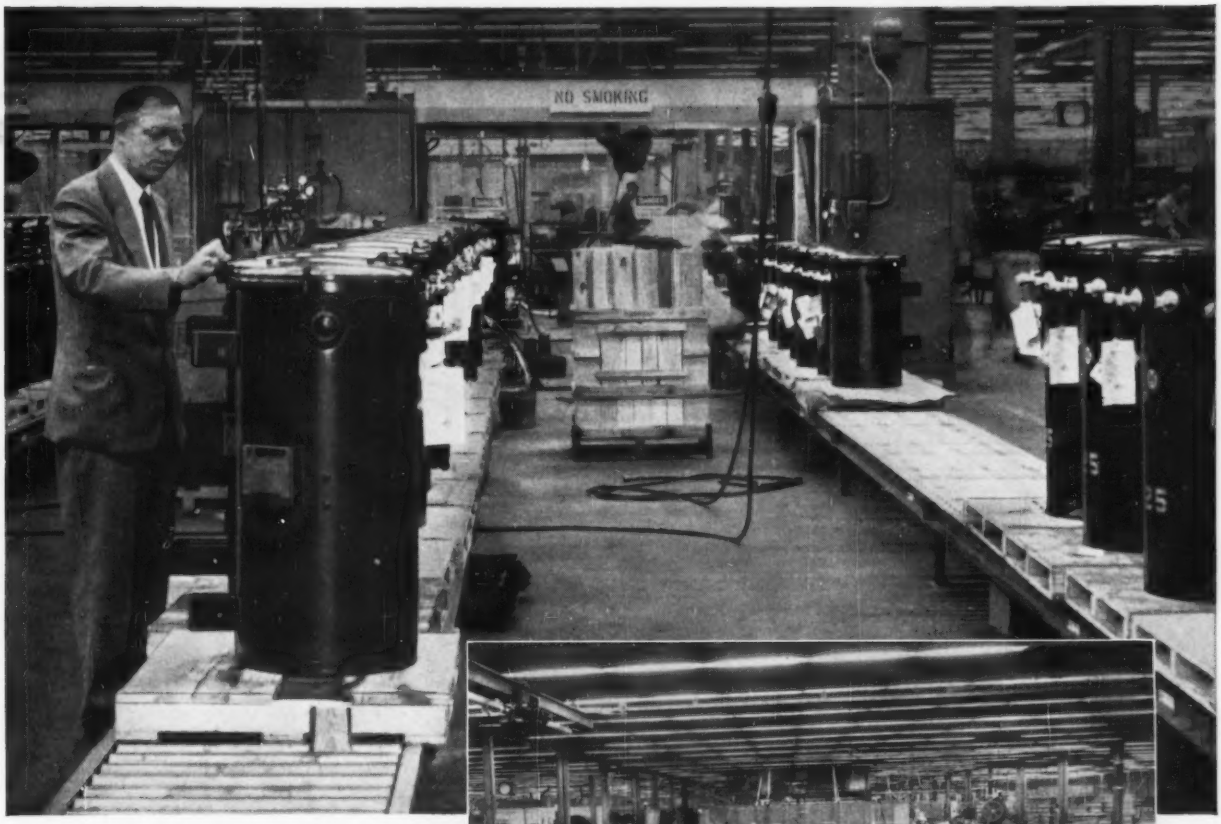
A-C ALLIS-CHALMERS

A-5100

ALLIS-

Production in Operation
Gadsden (Ala.) Works

New Facilities Supplement Pittsburgh Works in Manufacture of Pole-Type Distribution Transformers

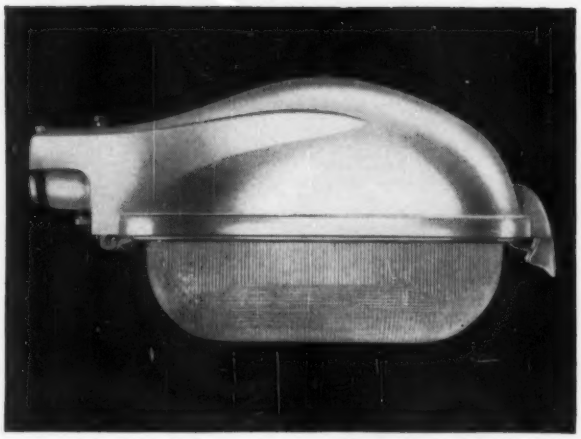


W. Damkoehler, Gadsden works manager, looks over distribution transformer ready for crating.

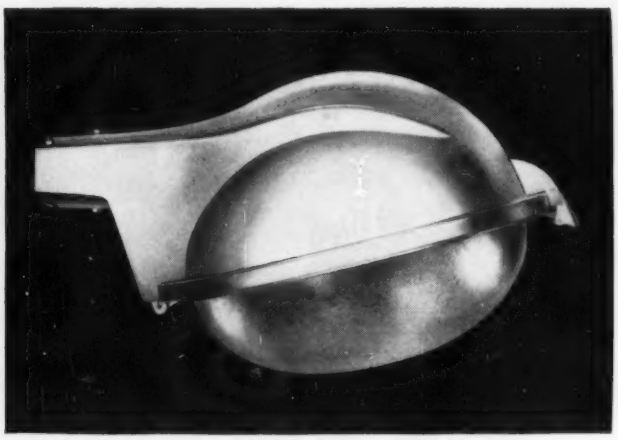
Core and coil assembly area for distribution transformers.

CHALMERS

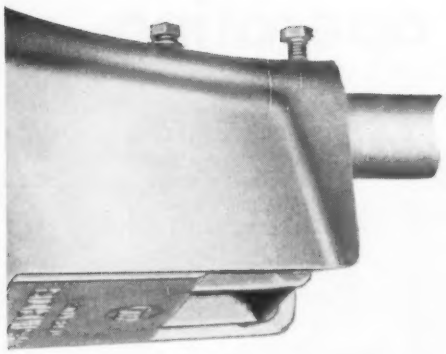
GADSDEN WORKS
Gadsden, Alabama



OV-20 uses 11,000-lumen CH-5, 15,500-lumen AH-1, 21,000-lumen EH-1, and 20,000-lumen JH-1 mercury lamps. Type II, III and IV distribution.



OV-60 uses 36,000-lumen AH-18, 34,000-lumen BH-18, 55,000-lumen AH-15, and 52,000-lumen BH-15 lamps. Type IV distribution.



New Westinghouse OV-35

. . . the first luminaire designed specifically for fluorescent mercury lamps

Westinghouse, pioneer in the development of mercury street lighting — the OV-20 and OV-60 — now presents the OV-35 luminaire which can be used with the 400-watt J-H1 or the 700-watt B-H18 fluorescent mercury lamps.

This third member of the Westinghouse mercury group now offers you a complete selection of mercury luminaires for any roadway application — regardless of width or traffic conditions.

The new OV-35 is the first street-lighting luminaire to include a completely sealed optical system — bugs, dirt or moisture cannot get in. Like the OV-20 and the OV-60, this new luminaire assures the best possible night visibility and a greater uniformity of pavement brightness. It inherits their same outstanding plus features, too . . . such as one-piece cast aluminum housing, new optical system, one-hand maintenance, and smooth good looks.

Whatever your roadway lighting requirements, be sure to specify Westinghouse mercury luminaires. More information? See your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio. J-04405

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TV AND RADIO!

Lapp Builds the

. . . to give extra years of operating

Shipments today of Lapp Line Posts are at an all-time high. Most of them are going to companies which bought their first Lapp Line Posts fifteen, twenty, even twenty-five years ago. On the record, the performance of these earliest Lapp Posts (and all since)—has never been approached by any other line insulator. There are good reasons for such a record—the original idea of a Post as an insulator designed to take advantage of the *strength* of porcelain (rather than to impose on its weakness)—and *the way Lapp builds* the Post, which assures in service every promise in theory ever made for it.

Lapp Insulator Co., Inc., Le Roy, New York.

NO CONDUCTIVE GLAZE • Lapp Line Post by *design* is free of radio and TV interference. No corona is formed at operating voltages, so no "treatment" is required.

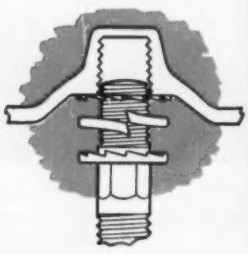
ONE PIECE PORCELAIN BODY • Porcelain is ten to twenty times as strong in compression as it is in tension. Lapp Post design eliminates nested porcelain parts, pins or other inserts, avoids internal strains. Stiffest under deflection.

FOG-TYPE LEAKAGE CORRUGATIONS • Multiple petticoats provide extra leakage distance and uniform leakage path; spaced for natural cleaning—wind and rain flush off contamination, keep surface resistance high.

SMALL DIAMETER • Lapp Line Post gets its flashover and leakage values from height rather than spread; easy for use with hot line tools.

SHORT, STURDY PETTICOATS • Maximum protection for insulator body under impact and flashover.

HARDWARE EXTERNALLY ATTACHED • Bases (and caps on Clamp-top Lapp Line Posts) are cemented ON. Porcelain is loaded only in a large-area low intensity compression grip.



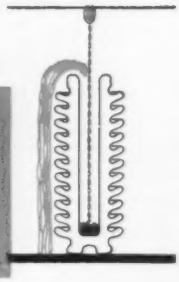
INTERCHANGEABLE STUD BOLTS • Easier stock inventory—separable long or short studs may be installed in the field. A positive lock washer, cooperating with serrated surfaces in insulator base and stud, permits easy removal, but locks stud against line vibration.

Line Post

security

LARGE CONDUCTOR GROOVE • Square-side top grooves meet new EEI-NEMA standards—provide for conductors of diameters up to 1 ½".

EASY TYING • Conductor groove, side groove and lip designed for fast, secure tie-wire attachment.



SOUND PORCELAIN • 100% electrical test before plugging or assembly—3-minute 60 cycle flashover from chain dropped entire depth of hole in inverted porcelain—assures soundness of head, soundness of whole porcelain.

INSIDE GLAZED • All Lapp Post porcelains are glazed inside and out—an extra-quality feature that makes for added cleanliness and more critical visual inspection.

LIVE TERMINALS are separated by full length of the insulator. Loss of one or more petticoats does not reduce flashover distance.

PORCELAIN and RUBBER PLUG • This Lapp design, unchanged for 20 years, assures a permanently clean, dry hole, prevents internal conductive contamination.

EASIEST CLAMP-TOP TO USE • Four sizes of clamps (interchangeable on all Lapp Clamp-top Line Posts) provide for all conductor sizes .25" to 1.50". Conductor installed without removing keeper; only one loose bolt (with captive lock washer) for complete installation. Great for hot-line work!

Lapp

SEVEN WONDERS OF THE

. . . developed with the help of the World's Greatest Lubrication Knowledge!

A giant wind tunnel that "flies" jets at supersonic speeds . . . a submarine that runs on nuclear power . . . a machine that makes genuine diamonds. These are some of the scientific wonders pictured on these pages. Each one is *the first of its kind*—designed to add to man's knowledge of the world around him. And each was developed with the help of Socony Mobil's vast lubrication knowledge.

When new machines are being planned . . . when unknown problems of lubrication lie ahead —machine builders and machine operators have found it pays to call on Socony Mobil.

Whatever *your* lubrication problems, large or small, we're ready to help you solve them . . . to improve your production, reduce costs through a program of *Correct Lubrication.*

SOCONY MOBIL

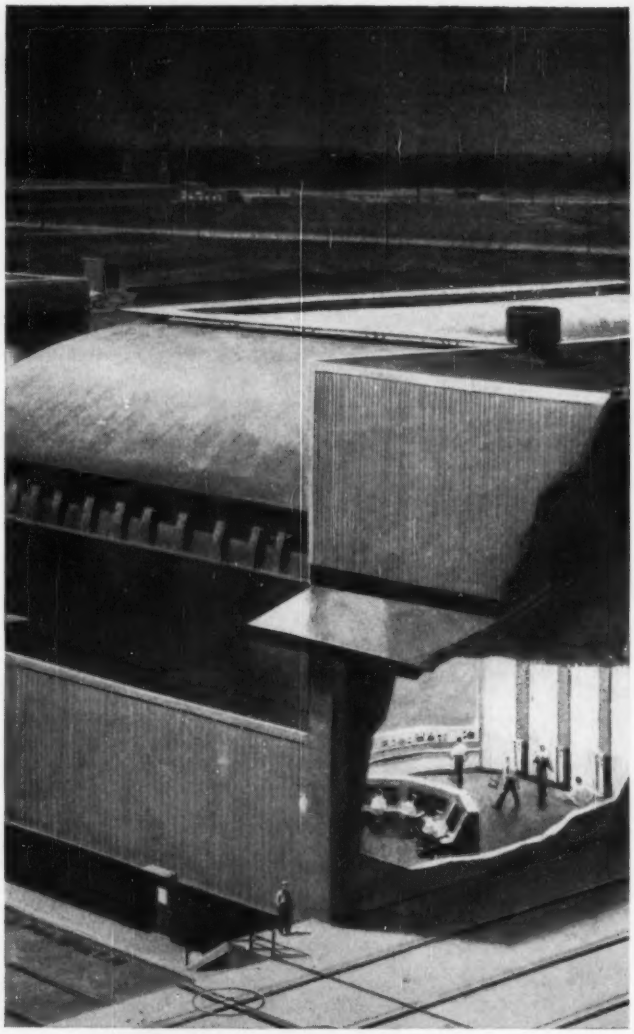
Mobil

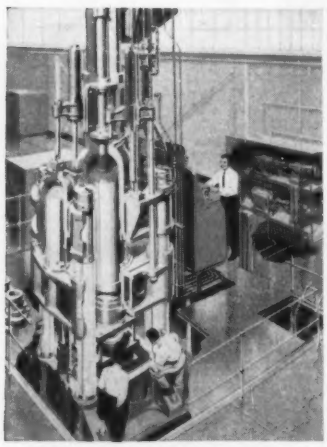
Correct Lubrication

FIRST STEP IN CUTTING COSTS

Leader in Lubrication for 90 Years

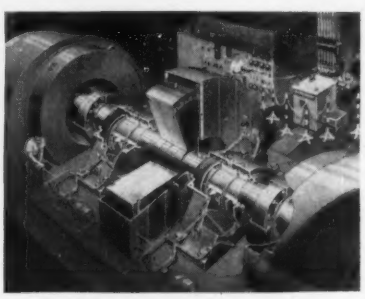
SOCONY MOBIL OIL COMPANY, INC., and Affiliates:
MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION, MOBIL OVERSEAS OIL COMPANY, INC.





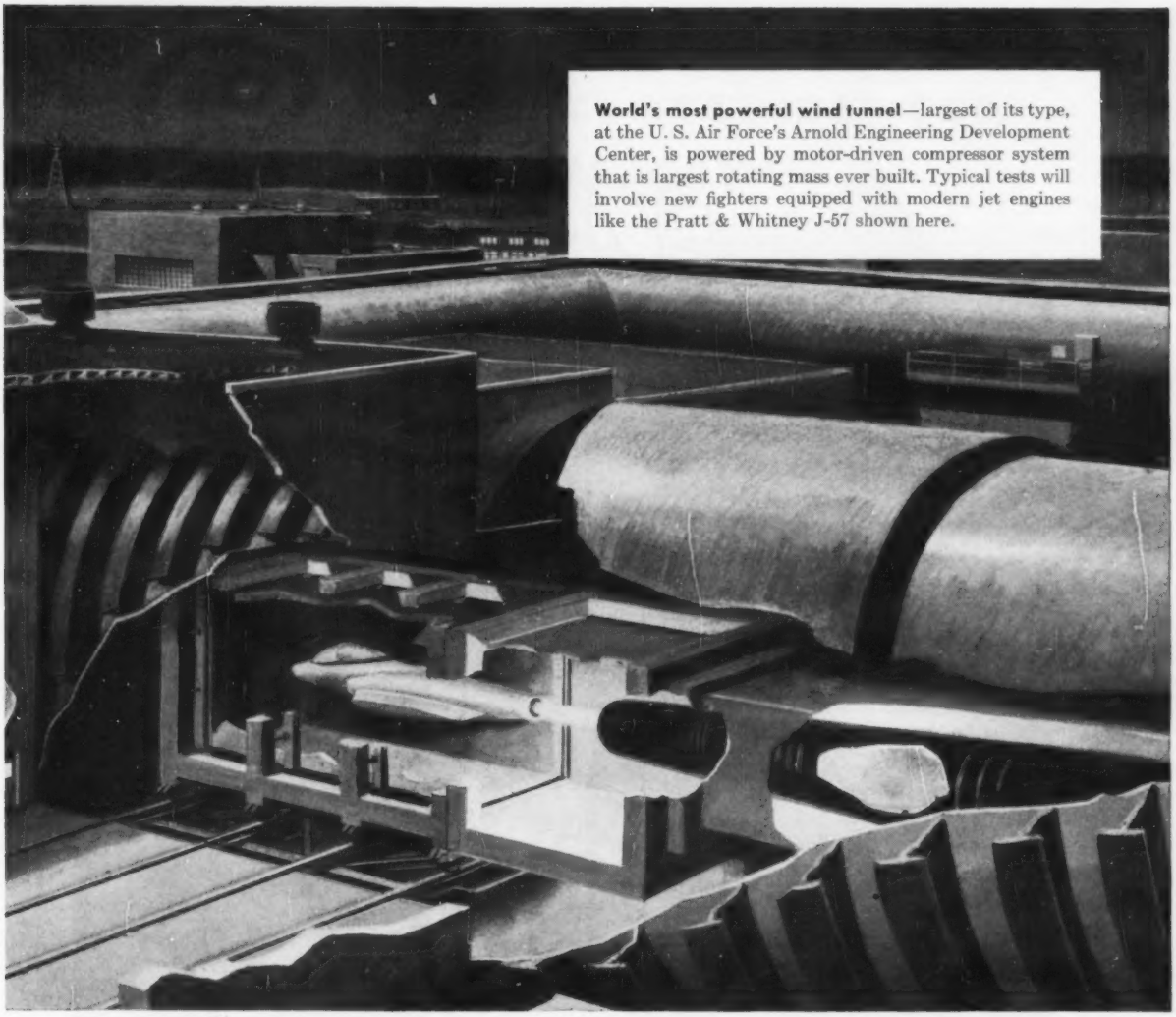
World's first atomic-powered submarine —U.S.S. Nautilus travels on power generated by fissionable material.

World's only diamond-making machine —develops up to 1,500,000 lbs. pressure and 5000°F. temperatures to create genuine diamonds.

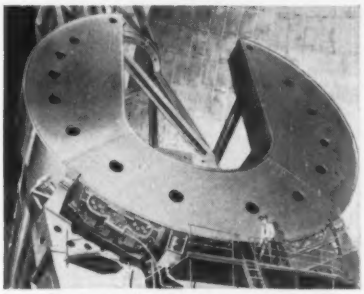


Giant atomic accelerator—the Cosmotron at Brookhaven National Laboratory is powered by a Mobil lubricated Westinghouse Motor Generator.

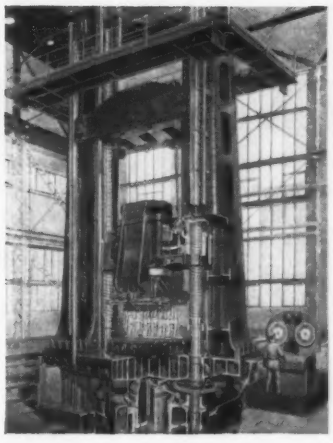
SCIENTIFIC WORLD



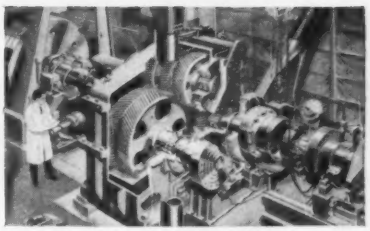
World's most powerful wind tunnel—largest of its type, at the U. S. Air Force's Arnold Engineering Development Center, is powered by motor-driven compressor system that is largest rotating mass ever built. Typical tests will involve new fighters equipped with modern jet engines like the Pratt & Whitney J-57 shown here.



World's largest telescope at Mount Palomar Observatory has 200" lens, weighs 500 tons. It floats on microscopic film of Mobil D.T.E. Oil.



World's largest testing machine can apply a tensile or compressive force of up to 5,000,000 lbs. to test full-scale sections or complete units of every type.



World's largest dynamometer tests brake materials under varying pressures, speeds and temperatures. 200-ton machine is 100% Mobil protected.

"Magic Touch"

Lights burn and wheels turn when the magic of electricity surges through industry's life line of high voltage cable. Long, intensive testing has proved beyond question that Simplex ANHYDREX XX insulated cable possesses the stability and resistance that assure long, trouble-free service in all environments. Its amazing resistance to ozone and other oxidizing agents make Simplex ANHYDREX XX the logical choice for your high voltage applications. For complete technical data write for Booklet 1023.

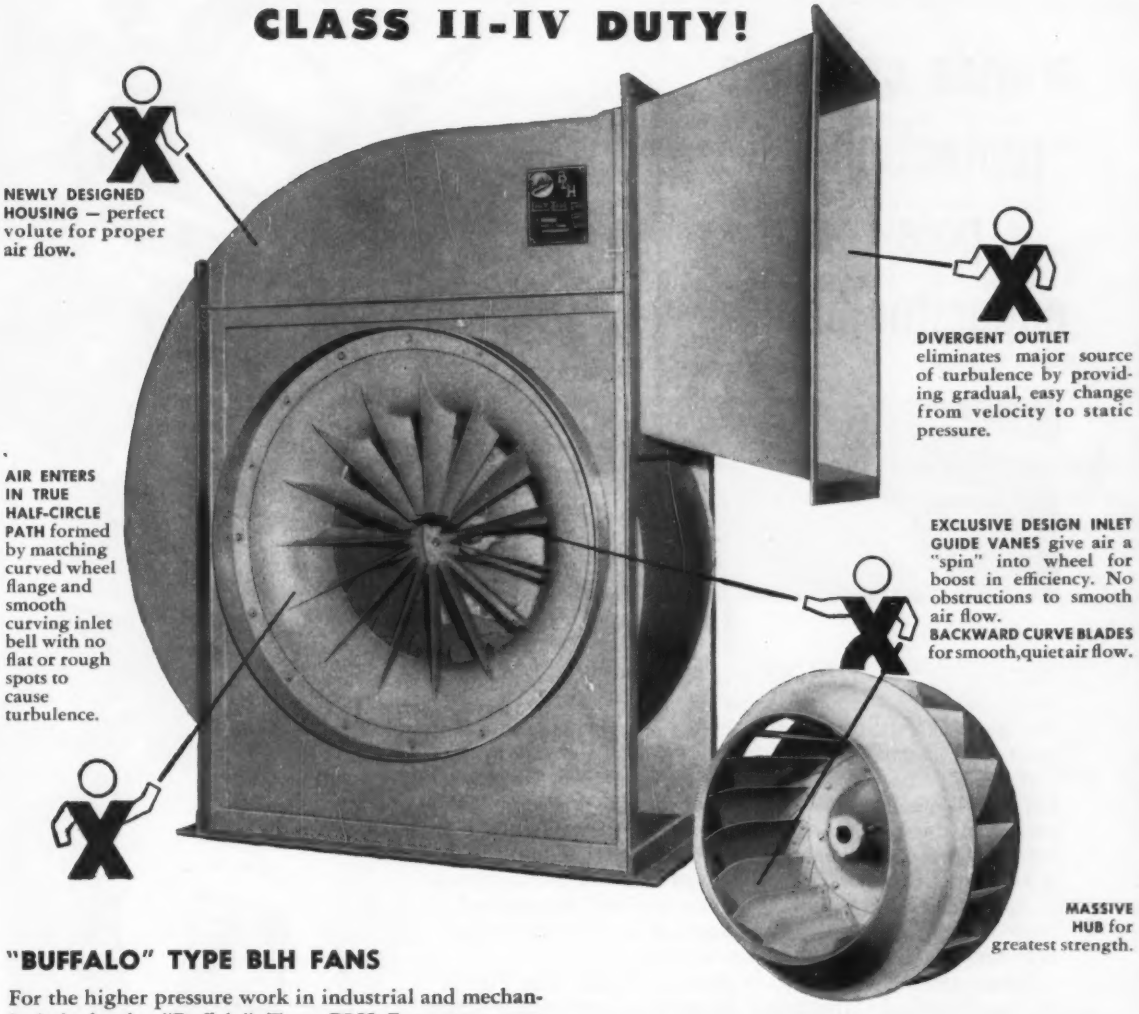
SIMPLEX WIRE & CABLE CO.,
79 Sidney Street, Cambridge 39, Mass.

LIVE BETTER ELECTRICALLY

Simplex

ANHYDREX XX

"X" MARKS THE NEWEST AND BEST PERFORMANCE FEATURES FOR CLASS II-IV DUTY!



NEWLY DESIGNED HOUSING — perfect volute for proper air flow.

DIVERGENT OUTLET eliminates major source of turbulence by providing gradual, easy change from velocity to static pressure.

AIR ENTERS IN TRUE HALF-CIRCLE PATH formed by matching curved wheel flange and smooth curving inlet bell with no flat or rough spots to cause turbulence.

EXCLUSIVE DESIGN INLET GUIDE VANES give air a "spin" into wheel for boost in efficiency. No obstructions to smooth air flow.

BACKWARD CURVE BLADES for smooth, quiet air flow.

MASSIVE HUB for greatest strength.

"BUFFALO" TYPE BLH FANS

For the higher pressure work in industrial and mechanical draft, the "Buffalo" Type BLH Fan sets a new performance pace with 86% mechanical efficiency. Its revolutionary divergent outlet and other "Q" Factor* features merit your consideration. One of a complete series of "Buffalo" Fans to match every set of conditions in steam power generation.

Write today for Bulletin F-200.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY
BUFFALO, NEW YORK
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

NOW

S&C positrol fuse links

provide complete protection for pole-top capacitor banks

S&C Positrol Fuse Links will give you adequate, economical protection of pole-mounted capacitor banks—even considering the more difficult fusing requirements of ungrounded wye-connected banks.

Available in a complete series of ratings, Positrol Fuse Links have a margin of safety to withstand overload conditions and short duration transient currents considerably above ratings. Unnecessary outages are eliminated, but fuse action is rapid and dependable in the event of a faulted capacitor.

And, since these fuse links employ the S&C magnesium borate "Arctrol" sleeve, interruption of low-current faults is faster, more effective, and less violent.

Information Bulletin 500 explains in detail "The Fusing of Pole-Mounted Capacitors." It provides application tables to facilitate the selection of the correct fuse links for every capacitor fusing problem. It should be added to the technical library of every distribution engineer.

Specialists in High-Voltage Circuit Interruption since 1910

Write for new Bulletin 500 which gives valuable information on capacitor bank fusing.

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

ELECTRICAL BUSINESS OUTLOOK

Electrical World
OCTOBER 1, 1956

You can look forward to higher price tags on most items of electrical equipment. General Electric Company's recent price hikes on capacitors and turbine generators will set the pattern for the industry. Higher steel prices are the main cause with aluminum and labor costs assisting. You get an idea of what this will cost utilities by applying price hikes to last year's utility purchases. Turbine-generators (upped 10% by GE) will cost the industry about $24 million more. Capacitors (up an average of 7½%) are expected to cost approximately $1.5 million more.

• • •

Total electric energy production this year will end up around 10% higher than 1955. And these gains, don't forget, will be chalked up despite this year's soft spots in two important sectors of the economy. There's no denying that autos and private housing have been a drag so far this year. But even so, energy production in the first 37 weeks of this year is up 11.0% over the same period last year. And this comes in spite of the month-long steel strike.

Private housing most likely will continue to be a weak spot. But maybe not for too long. Recent relaxation of requirements for home loans guaranteed by government agencies probably won't help too much. The move really didn't strike at the heart of slump—the lack of mortgage money. But at least it shows the wheels are starting to turn.

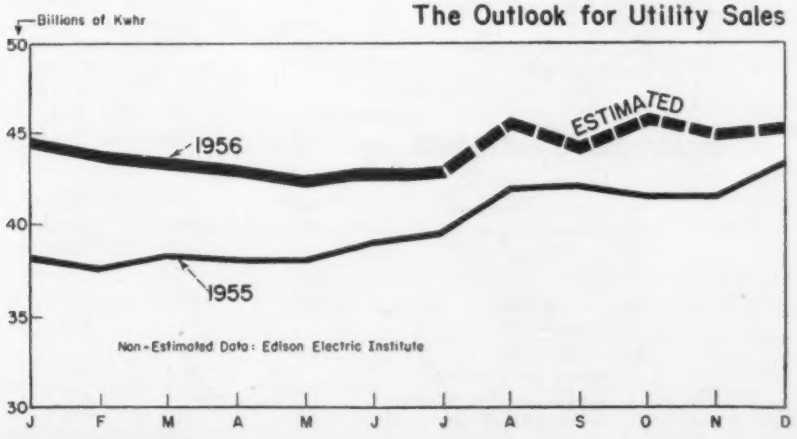
• • •

Electric appliance sales have been pinched somewhat by this year's low rate of housing starts (and tighter credit). Indications are that retail sales of some items are lagging last year by a considerable amount (air conditioners after a flying start, fell flat when anticipated hot weather didn't materialize in most sections of the country). Others are doing better.

• • •

The appliance business should be better in the next few months. National Electric Manufacturer's Association's July index of manufacturers shipments hit 111% of the 1947-49 average—13% higher than last year and 5% more than June. True, a part of this can be attributed to higher price tags—but not 13%. And don't forget the items in this index are the load builders. Included among these appliances, are electric ranges, clothes washers, freezers and refrigerators.

The Outlook for Utility Sales



STATISTICS

Generation in First 6 Months Tops '55 Period by 14.4%; Sales Up 13.8%

(Millions of kwhr)

In six months ended June 30, utilities

Generated . . . 295,477 (14.4% over '55)
230,416 by fuel (up 15.3%)
65,061 by hydro (up 11.4%)

Imported . . . 1,486

Less . . . 7,586 used by producer
818 in company use
27,144 lost & unaccounted for

Leaving . . . 261,415 in sales to ultimate customers (13.8% more than 1955)

Of the total utilities sold . . .

67,887 to residential customers (12.2% more)
4,951 to rural customers (5.6% more)
41,718 to commercial customers (9.7% more)
136,577 to industrial customers (16.9% more)
2,293 to street & highway lighting customers (18.6% more)
5,388 to other public authorities (8.6% more)
1,267 to street & interurban railways (4.0% less)
1,043 to electrified railroads (1.9% more)
291 for interdepartmental users (0.2% less)

Source: Edison Electric Institute

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	June	117.50	117.43	107.62	9.2
Peak—Class 1 Systems (million kw)	June	97.0	92.6	86.6	12.0
Estimated Dec. '56 Peak	July	106.09	106.06	103.47	2.5
Production—billion kwhr	June	49.45	49.09	44.23	11.8
Hydro		10.05	11.70	9.71	3.5
Fuel		39.40	37.39	34.52	14.1
Sales—billion kwhr	June	44.53	44.18	40.10	11.0
Residential		10.98	11.02	9.62	14.1
Commercial		7.28	6.74	6.51	11.8
Industrial		23.80	24.04	21.62	10.1
Other		2.48	2.38	2.36	5.1
Fuel Consumption	June				
Coal—million tons		12.34	12.05	11.07	11.5
Oil—million barrels		4.61	4.47	4.69	− 1.7
Gas—billion cu. ft		127.04	110.51	107.42	18.3
Net Income Class A & B Co's—$ million	July	96.86	102.20	89.40	8.3
Residential Customers—millions	12 mos.	44.99	44.87	43.76	2.8
Revenue per kwhr	ended	2.62¢	2.62¢	2.67¢	− 1.9
Avg kwhr per customer	June 30	2,879	2,858	2,649	8.7
Avg annual bill		$75.43	$74.88	$70.73	6.6

Business Statistics . . .

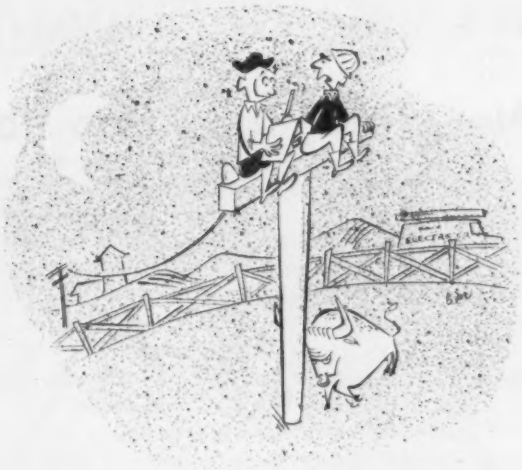
Indexes: 1947–49 = 100					
FRB Industrial Production	Aug.	141	128	139	1.4
ENR Construction Cost	Sept.	147.8	146.0	141.0	4.8
BLS Cost-of-living	Aug.	116.8	117.0	114.5	2.0
NEMA Sales					
Insulation materials	July	117	156	117	0
Electric appliances		111	106	98	13.3
Wholesale prices	May				
Motors and generators		132.1	130.4	120.8	9.4
Transformers and regulators		137.5	135.3	127.3	8.0
Switchgear and fuses		151.2	149.0	135.6	11.5
GNP—annual rate—$ billion	2nd Qtr.	408.3	403.4	387.4	5.4

Your Business

Live Better . . . Electrically (circa 1749). Benjamin Franklin, born just 250 years ago, livened up a river party in the summer of 1749 by igniting a fire by means of an electric spark, killing a turkey with electricity, roasting the fowl on a spit that was turned by electric current, and finally discharging guns by electrical sparks.

This 200-year-old version of our Live Better . . . Electrically program is recounted in a recent pamphlet put out by the advertising agency of Batten, Barton, Durstine, & Osborn. The pamphlet also notes that Franklin was considerably annoyed that electricity could not be put to use to lighten man's burden or add to his comfort. One may wonder whether Mrs Franklin fully realized that the demonstration contained some ideas for useful kitchen appliances.

Perhaps Ben, and Mrs Franklin too, might feel at home in our kitchens of today. But one wonders if they might not be a little surprised at the mans' suit that can recover its creases after being washed and dried in our home laundry machines or the smooth-shaving electric razors that whisk away whiskers.



"Stop figuring out your overtime and see if you can figure out how we can get out of here!"

Your Health—"Oh! My Aching Back."

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

George had severe pain in his lower back. No matter what position he took, it hurt. His back was twisted and he moved with a sliding motion. He had pain down his left leg. He had fallen several years ago, bruising his back. His symptoms then were back pain and stiffness. His present attack of pain began with a "catch-like" sensation in his back.

Deciding the cause of backache requires a detailed history and examination. X-ray examination may help. Many conditions cause back pain. Among these is a ruptured inter-vertebral disk. This was George's trouble.

Between each of the vertebrae there is a disk or pad of tissue. One or several of these disks can rupture and protrude their substance into the spinal canal. The resulting pressure causes nerve pain—in the legs if the protrusion is in the lower spine and in the arms and shoulders if it is in the upper spine. Usually only one extremity is involved. There may be reflex changes. There may be tenderness in the back and muscular spasm. The pain is aggravated by coughing or sneezing and by bowel movements.

If the protrusion persists, numbness and loss of sensation and muscle atrophy also occur in the affected extremity.

Most cases of ruptured inter-vertebral disks seem to come and go. Sudden twists or lifting bring them about and in a few days all of the symptoms disappear.

The diagnosis can usually be made by direct examination. In persistent cases the physician may perform a spinal puncture and examine the spinal fluid. He also can inject a dye into the spinal canal and take X-rays to outline the protruded disk.

Conservative treatment is first employed. Bed boards are placed under the mattress. Heat is prescribed. Braces and corsets can be used to support and protect the back. Weights and pulleys can be attached to the ankles to extend and separate the spaces between the vertebrae. Sedatives and anti-pain tablets may be necessary.

After repeated attacks with persistent pain, altered reflexes and loss of sensation, the patient needs something other than conservative treatment. The protruding disk can be removed surgically and the nerves freed. After surgery patients are cautioned against lifting or stooping for several months.

The knife-like pain of a ruptured inter-vertebral disk can make movement almost impossible. If this agonizing pain persists, the disk should be removed.

The relief of the pain gives these patients a tremendous lift and they do surprisingly well. Any residual back weakness is certainly better than the agonizing back ache.

WASHINGTON COMMENT

New Push for Atom Power Development

V. Craig Richter, Washington Correspondent

Three months remain before Congress meets again. With the new Congress will come a renewed push for a federal nuclear power program. This is a safe bet regardless of the outcome of the elections.

It is questionable whether proponents of the federal program will allow anything the Administration or industry does at this stage to take this issue away from them. But what Washington thinks about and how it feels about the industry position are worth relating and judging.

What is the feeling here regarding the industry's performance? Should the industry be doing more? If so, what should it be doing?

Right Track, More Should Be Done

Washington opinion generally falls into these schools of thought:

1. The present nuclear power program is adequate and represents as much progress as available manpower, money, and knowledge can assure.
2. The present program is on the right track, but more could and should be done.
3. The present program is inadequate. Private industry has muffed the chance it was given in 1954. The government should take the job of doing what private industry has failed to do.

Assuming the second school of thought is the closest to the true position, what should industry be doing?

The answer given is short: "Build more reactors."

This, of course, raises some questions. The Atomic Energy Commission has argued that most of the promising reactor concepts have been staked out for development. But some experts believe there is at least one promising type that is being overlooked today. This is the heavy water, natural uranium reactor. Opinion is this offers a "good bet" for some group of companies or single company.

"Build More Reactors"

The emphasis in the comment "Build More Reactors" though is not so much on new types. The experts here argue like this:

Why not build additional copies of existing types of reactors which have proved safe and reasonably promising. In view of American industry's ability to lower costs by repeat production, isn't it logical to assume that costs can be cut on reactors where more than one has to be manufactured at the same time?

Because the cost of a reactor is such an important factor in the present stage of the art, industry would thus be making a contribution to the cost picture, regardless of whatever technological advances might subsequently materialize.

Continuing with this picture, the experts point out there could be other gains in the cost picture. By broadening the field of users of reactors, a substantial load could be built up for the fabricators of fuel elements and for chemical processing of spent fuel elements. Present costs in these fields are high. Only greater industry participation—and this hinges on growth in demand for the services—can hope to lower these costs.

TECHNICAL NOTES

Automatic welding resurfaces pulverizer rolls for coal at less cost than hand welding. The operation takes place in a 400C oven to guard against roll cracking.

System growth can make grounding more or less effective, with corresponding changes in the maximum 60-cps voltage imposed on lightning arresters.

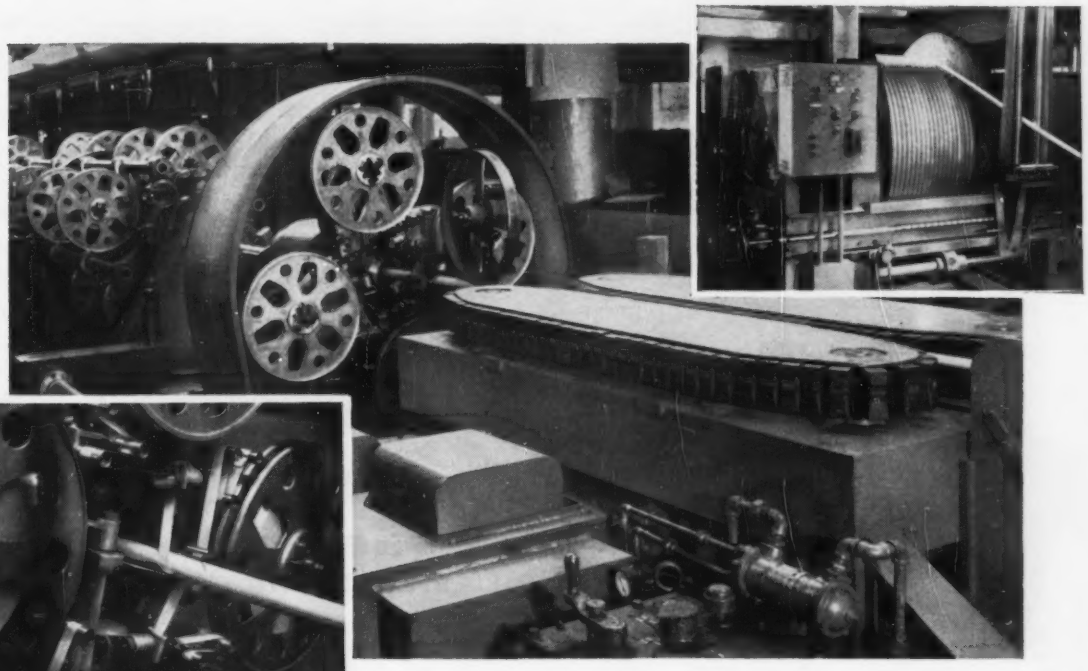
Simplicity in industrial distribution systems holds cost down and improves service continuity by facilitating faster maintenance.

TV interference traced to slack, oxidized, or corroded metallic joints between insulators of a suspension string or its related hardware vanishes when transmission lines are modified to keep these joints under tension.

Uranium bismuth as a power reactor fuel can carry heat away from the core, is free from radiation damage, can be handled by pumps and processed continuously with no limit on fuel burnup, and has a large negative temperature coefficient to compensate for load changes.

Termites and decay eschew fence posts soaked in copper sulphate followed by sodium chromate which react in the wood to form insect and fungi-killing copper chromate.

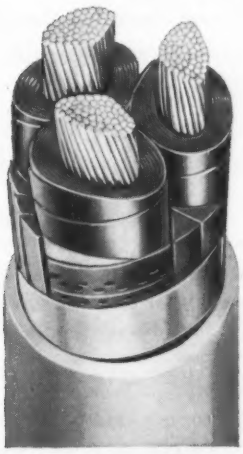
ROEBLING INVESTS IN YOUR FUTURE



MAIN PICTURE: Endview of taping machine showing caterpillar pull out

INSET AT UPPER RIGHT: Controlled tension take-up

INSET, ABOVE: Taping heads controlled tension



New, improved paper taping machines bring you far superior "paper and lead" cables

SHOWN ABOVE is one of the most modern paper taping machines in production today . . . applying tape to Roebling Paper Insulated Cables with an accuracy that brings new measures of insulating efficiency.

Outstanding features of these machines are:

★ Caterpillar pull-out which prevents distortion of paper tapes;

★ Improved gearing and "squirrel cage" machine design which eliminates backlash and insures uniformity in taping;

★ Controlled tension take-up which can be varied to suit the individual needs of each cable;

★ Controlled tension pay-off, coordinated with caterpillar pull-out;

★ Taping heads with automatic tension control.

The installation of this machine is just one part of a modernization program designed to give you paper insulated lead covered cables of outstanding dependability and service economy.

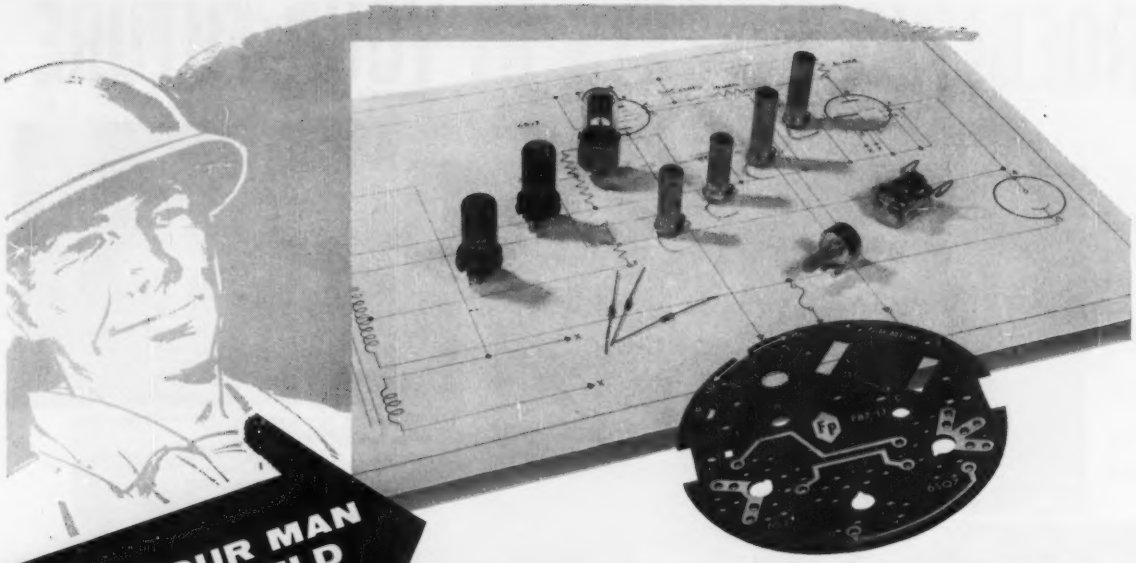
Let us consult with you on your individual cable problems. Our engineering and metallurgical staffs are always available.

ROEBLING ELECTRICAL WIRES AND CABLES ARE AVAILABLE WITH EITHER COPPER OR ALUMINUM CONDUCTORS

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2340 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4501 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.



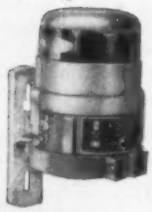
ASK YOUR MAN IN THE FIELD ABOUT THE

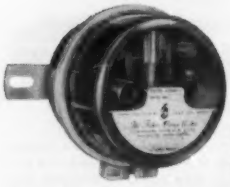
component quality

OF FISHER-PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

A look inside any Fisher-Pierce photoelectric lighting control immediately reveals a primary reason why they require extremely low maintenance and provide long-run economy: *component quality*. Here are specific examples: two *pre-aged* amplifier tubes, instead of one dual triode, for a guaranteed minimum life of 20,000 hours; *wire wound* potentiometer; *Sigma* sensitive relay for low plate current drain of power tube; *linen-based bakelite* sub-mounting chassis and etched circuitry; *metal encased* paper capacitors (no electrolytics); blue-sensitive 1P39 phototube with non-hygroscopic base. No other photoelectric control provides such consistently high component quality. Combined with this are these four other important features:





DESIGN ADVANTAGES — Can be installed, serviced or removed safely and easily • Wide mounting versatility and orientation after bracket installation.

PROTECTION — From surges and lightning, by linen-based bakelite sub-mounting chassis and proper component spacing Circuit and load fuses, and lightning arrestor • Fail-safe operation.

ADAPTABILITY — Three basic series and numerous models for all mounting requirements, operating voltages, load capacities and desired contact arrangements.

DEPENDABILITY — Proven by the thousands of F-P controls used by hundreds of utilities, over the past ten years.

Complete specifications and operating data are contained in informative F-P Bulletins, available on request. Or call the Fisher-Pierce sales representative in your area, for point-by-point proof of F-P superiority.

THE FISHER-PIERCE CO., INC.

82 Pearl Street, So. Braintree, Boston 85, Mass.

Play It Safe with 3 Tanks

Protection is the big reason for using breakers —so why take less than the best?

Get positive protection with Allis-Chalmers tank-per-phase construction. Today's low reactance systems with corresponding high fault currents require maximum protection. Three tanks eliminate danger of internal phase-to-phase flashover usually caused by line-to-ground fault.

Tank-per-phase construction has other advantages. Tanks are smaller, easier to handle, oil contamination is reduced, and only the faulted phase is affected.

Here's big breaker construction at no extra charge.

These breakers also feature: AEIC-NEMA standardized control wiring; two vertical breaks per phase, using time-tested *Ruptor* device; self-aligning, self-wiping tulip and bayonet contacts.

Ask for Bulletin 71B7946 for the complete story. Contact your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Ruptor is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5145

NEW! PHILCO

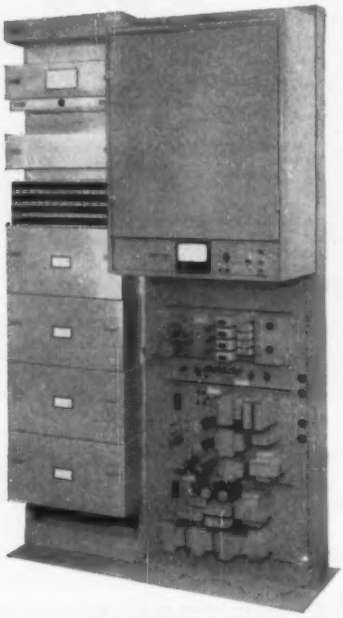
HERE are new Microwave "Packages" by Philco, pioneer in the design and manufacture of microwave systems. Each new package incorporates advanced techniques in communications and control. All components have been selected for superior performance and greatest reliability. Outstanding features of Philco Microwave Packages can lower your installation and operating costs; write Philco now for complete information.

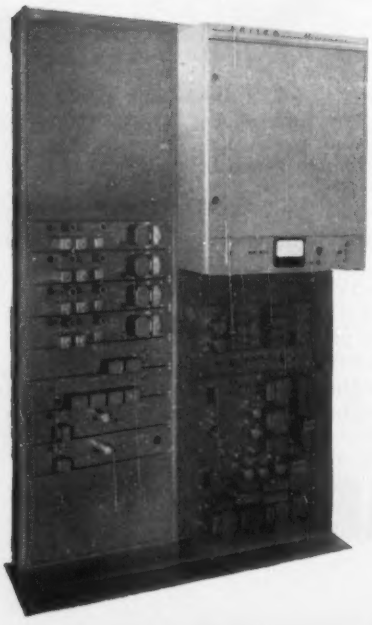
PHILCO Series 500 ▶

Philco Series 500 Package is designed primarily for pipe line and railroad companies requiring maximum dependability consistent with highest commercial performance standards along extensive right-of-way routes.

FEATURES

- **Expandable to 24 or more channels (plus service channel)**
- **Extendable to 40 hops (1000 miles)**
- **Commercial quality circuits**





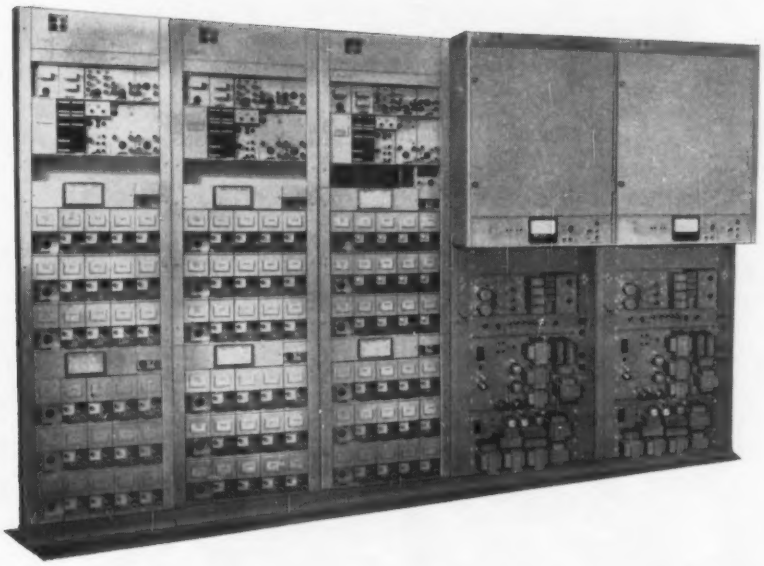
◀ PHILCO Series 120

Philco Series 120 Package is designed to provide low cost, reliable communications over moderate distances for turnpikes, police, and utilities.

FEATURES

- **Lowest cost per channel mile**
- **Expandable to 24 or more channels (plus service channel)**
- **Extendable to 10 hops**
- **Commercial quality circuits**

Microwave "Packages"



PHILCO Series 90

Philco Series 90 Package is designed to provide the high performance and reliability required by common carriers and government agencies. Full 100% standby with completely automatic switching is included.

FEATURES

- Utmost reliability
- Expandable to 60 channels
- Extendable to 5 or more hops

Philco maintains a staff of experienced engineers to conduct surveys, plan, and install complete systems to satisfy even the most complex communications requirements. These men have successfully completed thousands of system miles, including one of the longest microwave communications systems in the world.

Write to Dept. EW for New Free Booklet

PHILCO
Famous for
QUALITY
the World Over

PHILCO CORPORATION

GOVERNMENT AND INDUSTRIAL DIVISION

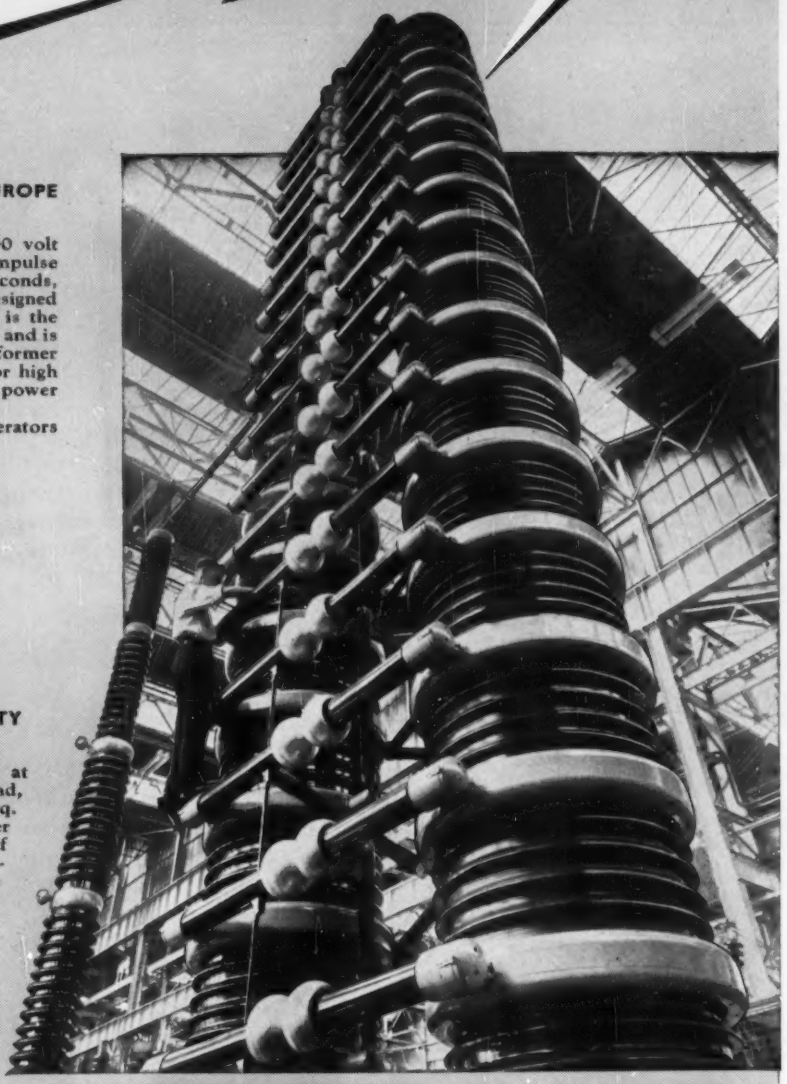
PHILADELPHIA 44
PENNSYLVANIA

In Canada: Philco Corporation of Canada, Limited, Don Mills, Ontario

4,000,000 VOLTS!

THE LARGEST
IMPULSE GENERATOR IN EUROPE

The illustration shows a 4,000,000 volt 18 stage, 2 column Ferranti Impulse Generator, energy rating 285 kW seconds, D.C. charging 220 kV per stage. Designed and built by Ferranti engineers, it is the largest impulse generator in Europe and is now installed in the Ferranti Transformer Factory at Hollinwood, England for high voltage impulse testing of large power transformers.
Ferranti High Voltage Impulse Generators are used throughout the world.



FERRANTI

OVER 5,000,000 kVA
per annum
of TRANSFORMER CAPACITY

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C. and D.C. Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

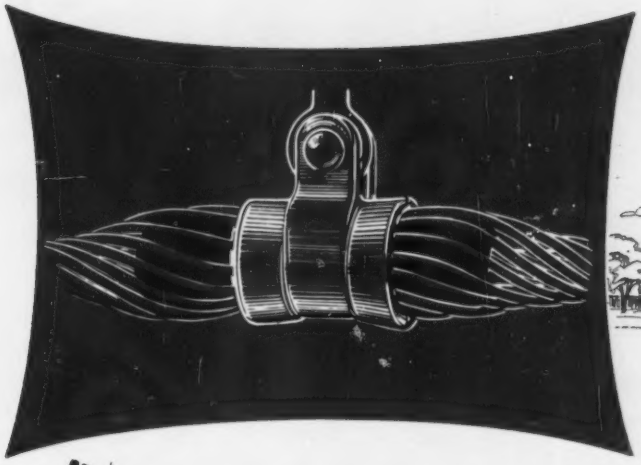
FERRANTI LTD

Head Office and Plant: **HOLLINWOOD · LANCASHIRE · ENGLAND**

OFFICES AND PLANTS

NEW YORK: Ferranti Electric Inc., 30 Rockefeller Plaza, N.Y. 20
TORONTO: Ferranti Electric Ltd., Mount Dennis, Toronto 15, Ontario
MANCHESTER, ENGLAND: Ferranti Ltd., Moston, Manchester 10
EDINBURGH, SCOTLAND: Ferranti Ltd., Ferry Road, Edinburgh 5

FT 176/2



"PERFECTING not PERFECTION is our goal" *

Yesterday's answers are not good enough. Today's will need improving tomorrow.

Take the problem of vibration fatigue. Failure of strand because of vibration or galloping does not occur in mid span. But it becomes a real problem at points of stress concentration, such as the end of the clamp keeper—at mass concentrations, such as at clamps, dampers and rigid splices—or at wearing points at loose attachments or fastenings.

Yesterday's answer—PREFORMED ARMOR RODS introduced by Preformed Line Products Company in 1947.

Today's answer—PLP PREFORMED ARMOR with pitch direction the same as conductor strand and pitch length less than that of strand (Patent No. 2,609,653). When used in conventional clamps:

- it extends uninterrupted conductor life
- it eliminates wear possibilities
- it prevents excessive mass and stress concentrations.

Tomorrow's answer is here today: the armor rod principle carried one step further in Preformed's ARMOR-GRIP SUSPENSION (Patent No. 2,722,393), the entirely new concept in suspension design.

The Armor-Grip Suspension Unit is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Rods which distribute their pressure over a relatively large area. The result: no wear possibilities—no mass concentrations—*and no clamping stress concentrations.*

This is another example of PLP research laboratories at work. Ever improving methods, materials and solutions is our goal. Call a PLP Representative today and ask for a demonstration.

* *John Dewey, "The Reconstruction of Philosophy"*

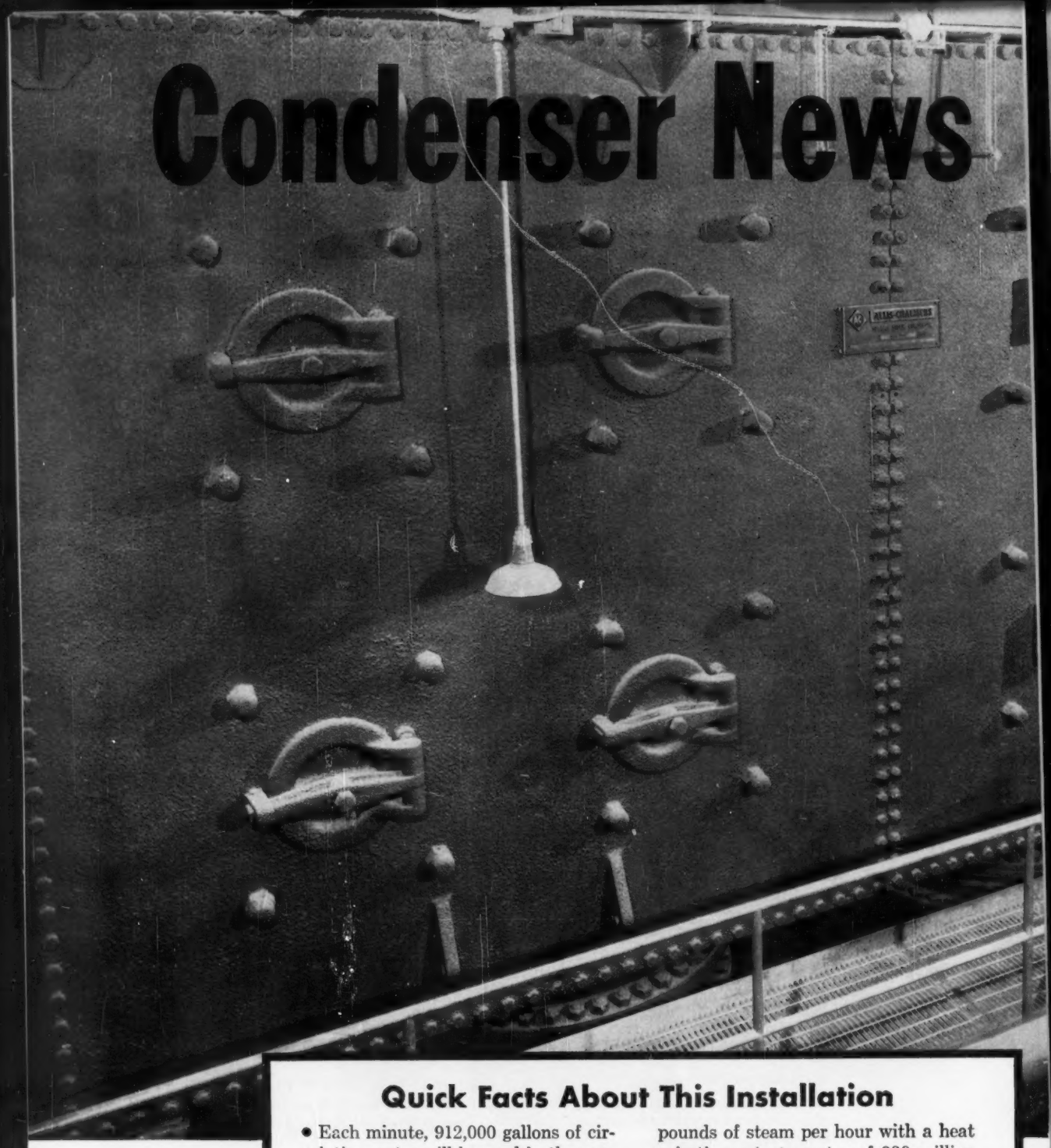
Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PLP

PREFORMED LINE PRODUCTS COMPANY

3349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

Condenser News

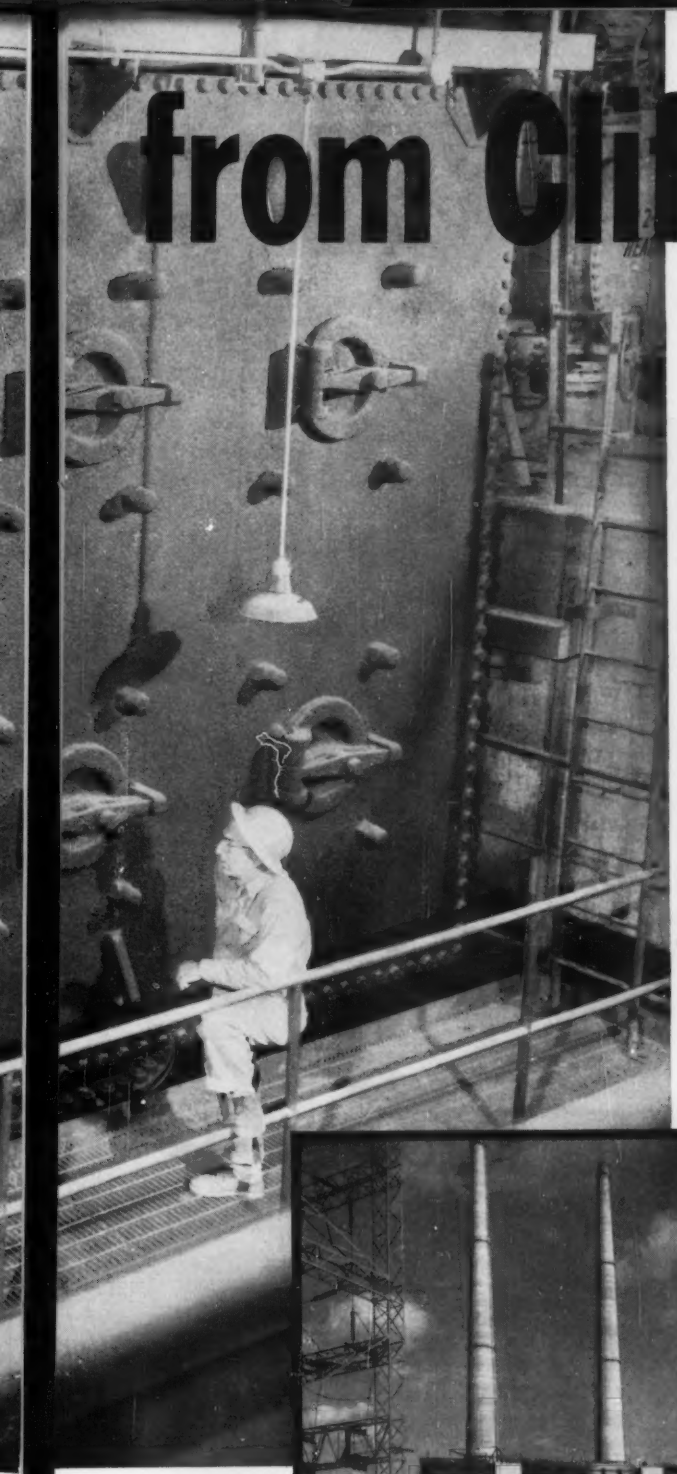


Quick Facts About This Installation

- Each minute, 912,000 gallons of circulating water will be used in the condensers . . . enough for a city of approximately 8,750,000 people.
- Each condenser will handle 979,000 pounds of steam per hour with a heat rejection rate to water of 930 million Btu per hour.
- About 500 miles of tubing went into the six 100,000-sq-ft condensers.

A Size and Type for Any Need

ALLIS-



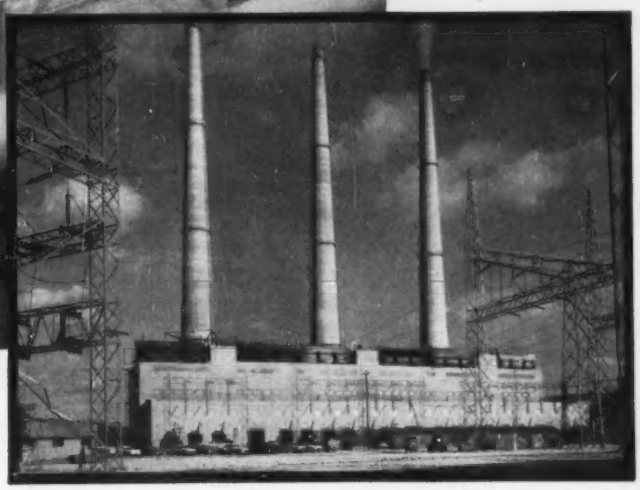
from Clifty Creek

World's Largest Investor Owned Generating Plant Completes Installation of Sixth Allis-Chalmers Condenser

More power for the Atomic Energy Commission! Giant Clifty Creek Plant, with a capacity of 1,290,000 kilowatts — more than that of Hoover Dam — is the largest power plant ever built by private enterprise.

Just completed, Clifty Creek is one of two major steam plants built by the Ohio Valley Electric Corporation to supply the electric power requirements of AEC's tremendous new Portsmouth (Ohio) atomic plant. Clifty is located on the Ohio River at Madison, Indiana. OVEC is sponsored by 15 private utility companies of the Ohio Valley region.

Six 100,000-sq-ft, single-pass Allis-Chalmers surface condensers serve the Clifty Creek Plant's six 215,000-kw steam turbine-generator units.



Condensers of Unusual Design

Multi-steam-path design is a feature of each condenser. This unique A-C design makes *all* tubes completely effective from one end to the other by directing steam to even the most remote sections of the condenser.

The result is high vacuum, high condensate temperature and good deaeration . . . in other words, high operating efficiency.

Get Information

For information about Allis-Chalmers multi-steam-path design, contact your nearest A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin. A-5038

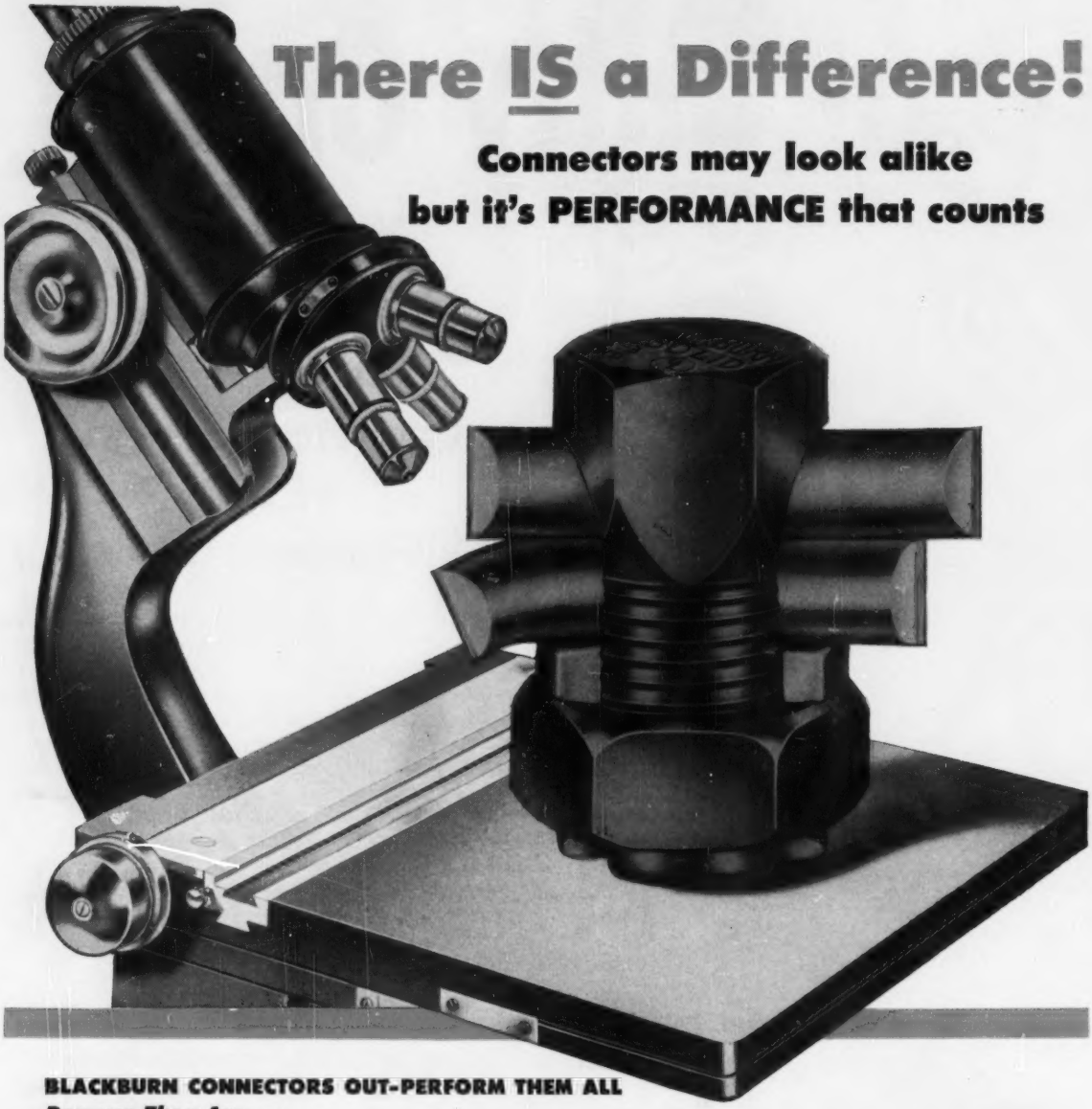
LIVE BETTER ELECTRICALLY

CHALMERS

A-C ALLIS-CHALMERS

There IS a Difference!

Connectors may look alike but it's PERFORMANCE that counts



BLACKBURN CONNECTORS OUT-PERFORM THEM ALL

Because They Are . . .

BETTER MECHANICALLY

- Made of high strength duronze, a silicon bronze alloy stronger than structural steel.
- Machine cut threads, *CFC treated, provides more thread engagement —reduces friction and increases thread efficiency. *Chemical Friction Control.
- Rigid inspection of each production operation assures uniformly good connectors.

BETTER ELECTRICALLY

- High clamping force—the result of greater thread efficiency breaks down oxide on the conductor improving conductivity.
- Higher initial conductivity, actually greater than an equal length of conductor is maintained permanently.

REUSABLE

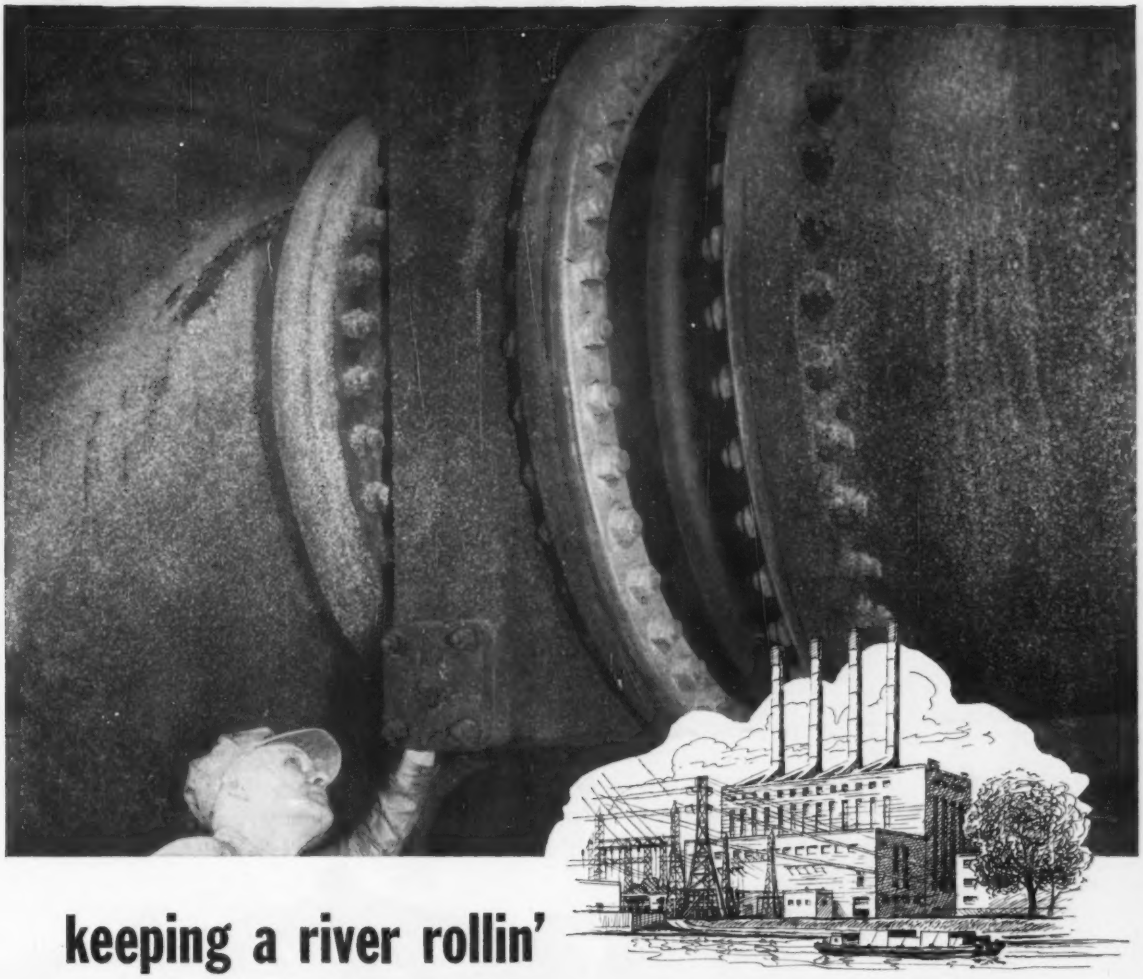
- Selection of proper high-strength, corrosion-resistant materials—plus precision workmanship and inspection—means Blackburn connectors may be used over and over.

BLACKBURN *Hi-Strength* CONNECTORS

AVAILABLE AT ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORP., 35 Madison Street, St. Louis 6, Missouri • Phone MAin 1-2821

EXPANSION JOINTS



keeping a river rollin' and the pipes from rockin'

A river of 390,000 gallons of water per minute rolls through the four surface condensers in Niagara Mohawk Power's plant at Oswego, New York. Here is generated enough power to heat 384,000 household steam irons every hour. Ravenous furnaces consume 3600 tons of coal every 24 hours at full load.

The piping in Niagara's condenser system can't rock or rattle itself to death despite the tremendous capacities and pressures encountered. U. S. Rubber Expansion Joints are the flexible connections that allow the pipes to give and take, to literally ride with the punch.

"These Expansion Joints were installed in 1940," says the plant superintendent, "and they've never given us trouble. We use them in sizes from as small as 6" all the way up to 48", and at water temperatures up to 170 degrees Fahrenheit. We know we will get many more years' wear out of them."

To absorb excess stresses due to expansion and contraction, to insulate against vibration, take care of misalignment, specify U. S. Expansion Joints. They are available at any of the 28 "U.S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

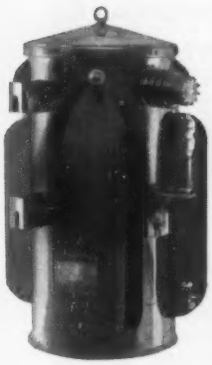
Watch NCAA football, Saturday afternoons, NBC-TV

Mechanical Goods Division

United States Rubber

Only Westinghouse offers you **the transformer**

with a PRE-TESTED LIFE!



Here's a transformer that can actually help you program your equipment investment thirty years from now—today. How? Through a revolutionary new concept of accelerated life testing, Westinghouse has pre-tested transformer life. Thirty years of equipment service has been telescoped into three.

Entire transformers from the production line have been put through literally thousands of cycles of overload up to 450% of rating, under closely simulated service conditions. Masses of data used to set up this unique program of testing include representative ambients as well as abnormal currents and voltages such as lightning and switching surges. Here is exhaustive evidence of durability of materials, uniform strength of windings, capability of whole insulation systems. Here is foolproof evidence of the soundness of Westinghouse transformer design . . . evidence that test-tube testing can't match.

The new Westinghouse Type S and CSP® transformer developments are based on the soundness of this design. Overload capability for all transformers has now been increased 20%, *without sacrifice in normal service life*. You get transformer capability tied more closely to modern load demands . . . a greater margin for peak. For the CSP transformer . . . fewer trip-outs, more time to make change-outs.

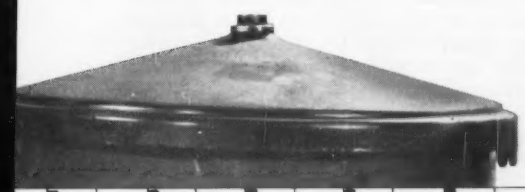
Are these transformers at these ratings proved on the line? 10,412 uprated Westinghouse transformers have operated successfully up to three years throughout the systems of utilities in New York, Missouri, Texas.

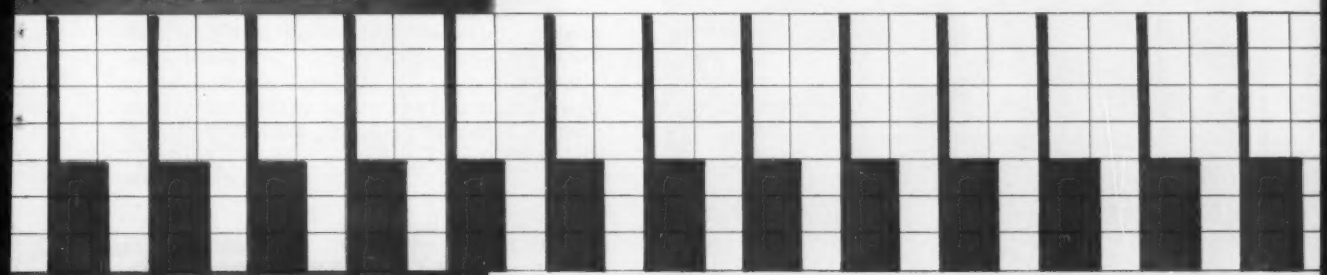
So here is double proof of performance of Westinghouse transformers. You don't have to gamble.

See your Westinghouse sales engineer, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70782

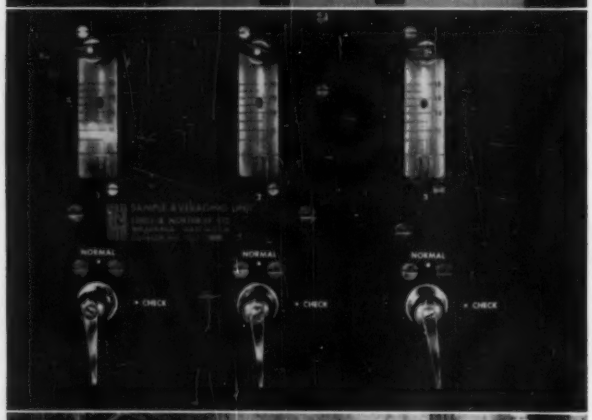
WATCH WESTINGHOUSE!

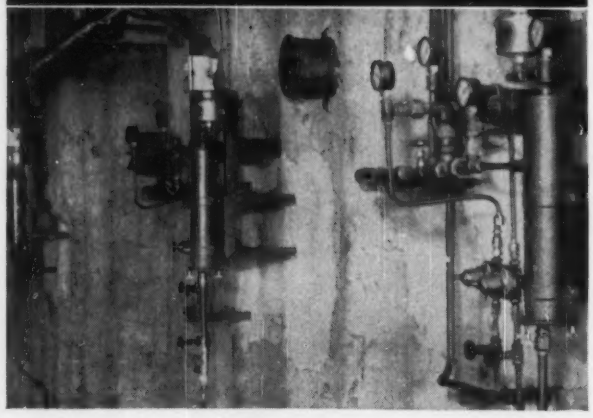
COVER THE PRESIDENTIAL CAMPAIGN ON CBS TELEVISION AND RADIO!





"Time and temperature tests on insulation or wire by themselves just aren't the answer," says A. M. Lockie, design engineer, who has developed exclusive, new life testing of distribution transformers. Life-testing procedures at Westinghouse are based on experience obtained from subjecting transformers to 2200 overloads, 30 short circuits at 15 times rated current, a series of impulse, dielectric and induced potential tests, and daily load cycles up to 450% of rating.





THE NEW SPEEDOMAX O_2 SYSTEM GIVES A CONTINUOUSLY ACCURATE COMBUSTION PICTURE...

Here's why!

■ Already, on some of the country's largest boilers, this new Speedomax O_2 System is enabling operators to trim excess air automatically to maintain combustion efficiency . . . and to do it with a certainty never before possible.

Why? As one operator put it, "The System gives me a record that's meaningful. When I look at this O_2 chart I know what's *really* happening—and I know it right away."

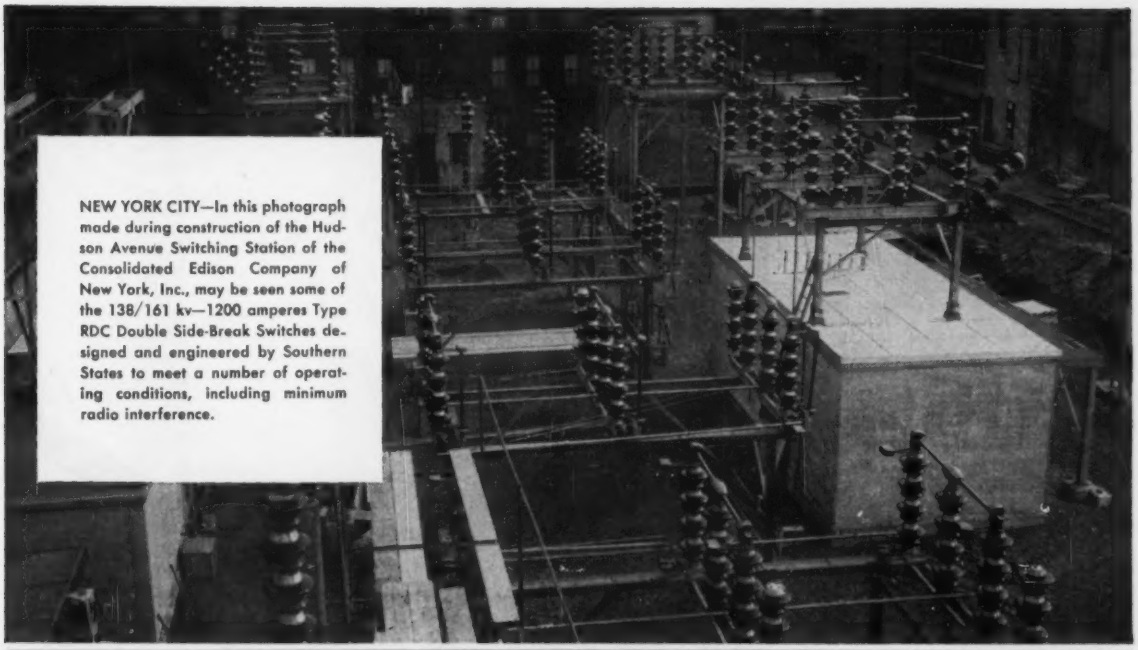
Behind this operator's confidence is the new L&N Multiple-Probe Sample Averaging Unit which *assures a more representative sample.* This unit maintains a true average from two, three, or more probes—even if individual sample flows drop 60 per cent. And excess air distribution across the duct can be checked right at the Averaging Unit.

There is also a new Reverse Jet Probe and Steam Sampler which delivers a *clean pressurized sample* even with the *dirtiest* of flue gases. Water jets flush the probe passage continually, steam ejector action pressurizes the sample, and steam condensing action plus centrifugal separation remove all dirt and acid.

And, in analyzing and recording, the speed of response of the Speedomax Recorder, coupled with the efficient operation of the L&N Magnetic O_2 Analyzer, increases speed and accuracy of O_2 analysis and recording even further.

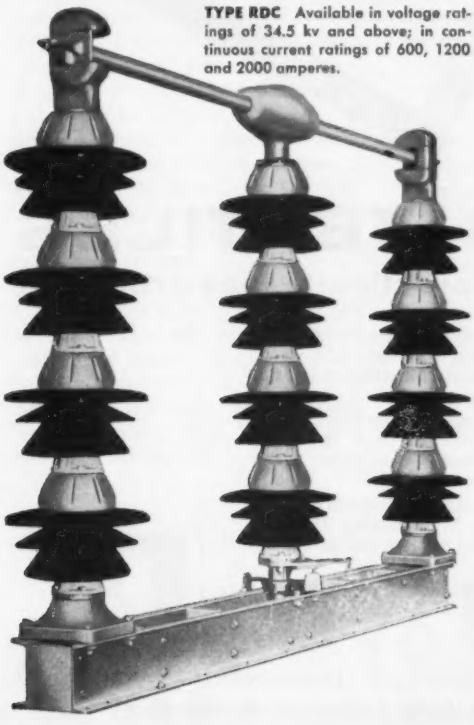
Why not learn more about this new Speedomax O_2 equipment and what it can do for you? Write to Leeds & Northrup Company, 4938 Stenton Ave., Philadelphia 44, Pa.

LEEDS *instruments* **NORTHRUP** *automatic controls • furnaces*



NEW YORK CITY—In this photograph made during construction of the Hudson Avenue Switching Station of the Consolidated Edison Company of New York, Inc., may be seen some of the 138/161 kv—1200 amperes Type RDC Double Side-Break Switches designed and engineered by Southern States to meet a number of operating conditions, including minimum radio interference.

Consolidated Edison Picks Type RDC Switches For its Hudson Avenue Switching Station



TYPE RDC Available in voltage ratings of 34.5 kv and above; in continuous current ratings of 600, 1200 and 2000 amperes.

The newest member of Southern States' complete line of air break switches was chosen by Consolidated Edison for its recently completed Hudson Avenue Switching Station.

The Type RDC has an RIV of less than 500 microvolts, a primary requirement for this station located in Brooklyn, New York.

There are many other advantages of this double side-break switch, including:

- **High momentary current rating**
- **Streamlined, corona-suppressing contours**
- **Minimum number of current interchange points**
- **Shuntless design**
- **Wide angle blade rotation**
- **AMPLITACT® silver-to-copper contacts**
- **Shielded mechanisms—complete icing protection**
- **Greaseless, non-corroding ball bearings**
- **Switch blade is one continuous member**

Your Southern States representative will be glad to give you more information about this new switch.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

The earliest Greeks used the "inextinguishable flame," as they called asbestos, for lamp wicks . . . the first record of the practical incombustibility of this historic mineral fiber.

Today, asbestos assists man in thousands of ways in modern living. For example non-ferrous K&M Asbestos tapes, like these illustrated, are relied upon for electrical insulation where voltages and temperatures are extremely high.

K&M ASBESTOS TEXTILES

insulate . . . protect from fire . . . are practically indestructible!

As ancient as writing . . . as modern as atomic energy, asbestos has unique qualities that have made it of constant use to man. And even today there is no substitute for the combination of characteristics it offers to industry.

Woven into cloth, tape or thread it makes superior electrical insulation . . . protects from heat and chemicals and retains its strength through a wide range of temperature and humidity conditions. And asbestos is immune to rot and corrosion, as well.

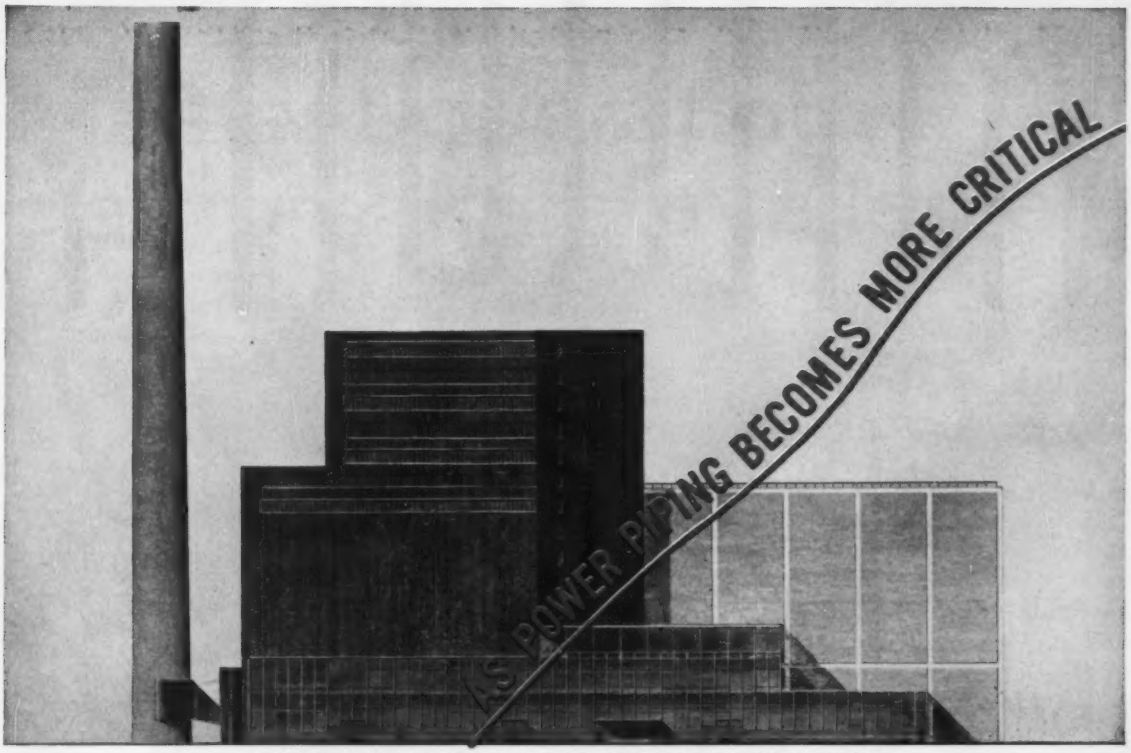
K&M Asbestos Textiles are made only from carefully selected grades of asbestos fibers to assure maximum uniformity and reliability. They're backed by more than half a century of imaginative research and development experience.

Investigate K&M Asbestos Textiles for any insulating problem you may have. Write or call us any time.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

IN CANADA: ATLAS ASBESTOS COMPANY, LIMITED; MONTREAL, TORONTO, WINNIPEG, EDMONTON AND VANCOUVER

K&M best in asbestos ®



Architect's sketch of Philadelphia Electric Company's new Eddystone station

Kellogg's High Alloy Fabrication Keeps Pace

Designed to operate at 5000 psi at turbine throttle valve, and 1200 F., Unit No. 1 at Philadelphia Electric Company's new Eddystone station presented critical problems in the selection of an alloy for supercritical pressure piping, and in techniques for fabricating heavy-walled sections of this alloy in the shop and in the field.

More than a year ago, The M. W. Kellogg Company presented a comprehensive program to the Philadelphia Electric Company for selecting a suitable alloy, and since then has been working closely with this public utility and other prime contractors toward completion of the project. Numerous materials were studied, welded, tested, heat treated, and evaluated at Kellogg's Jersey City metallurgical laboratories. After many months of extensive and intensive work, Type 316 Stainless was selected. M. W. Kellogg has already perfected welding techniques, and is now continuing tests on this alloy and several other compositions, including strain aging for 1000 hours and 10,000 hours at 1300 F., to accumulate other data.

While this is the first time that Type 316 will have been used in power plant service for temperatures as high as 1200 F., and pressures as much as 5000 psi, it is by no means Kellogg's first experience with Type 316 or other stainless steels. For example, M. W. Kellogg recently undertook metallurgical studies and research for another large public utility prior to its selection of Type 316 for use at 1100 F. and 2400 psi. Kellogg also has done considerable fabrication of main steam lines and turbine leads, using Type 347.

The M. W. Kellogg Company welcomes the opportunity of discussing future power piping requirements with consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

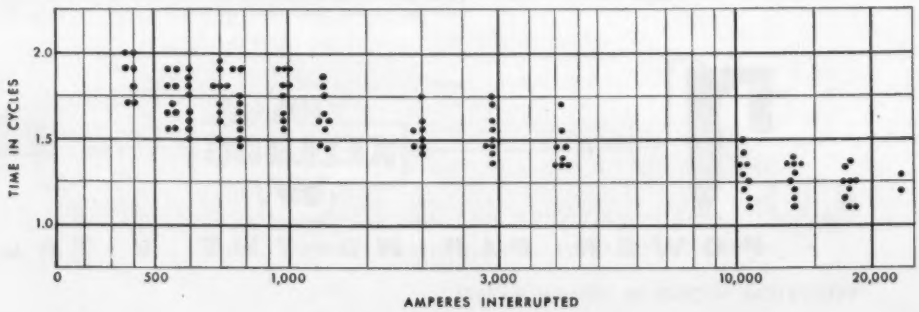
FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.
A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York • Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

POWER PIPING—THE VITAL LINK

Proved again the fastest, most efficient principle of arc extinction ever devised . . . Above, the exclusive Westinghouse De-ion® arc interrupter in action. One of the features that makes possible the many advancements and leadership of Westinghouse-designed breakers.

Results of typical interrupting tests with the new 50-DHHS air breaker . . . several hundred interruptions, 500 to 30,000 amps, interrupted within two cycles.



Westinghouse paces industry needs with

fastest operating air breakers available

Your present and future needs in air circuit breakers are assured by recent Westinghouse developments. In a move to keep a jump ahead of utilities requirements in basic circuit protection, Westinghouse has developed a series of new ratings in air circuit breakers for use in metal-clad switchgear.

These metal-clad breakers cover important utility applications including 4-kv distribution circuits, large metropolitan substations and generating station auxiliary power needs.

New ratings have been added to the standard line of Westinghouse 5-cycle breakers. The breakers described below, featuring new interrupting ratings and times, have behind them the outstanding experience and reliability of Westinghouse plus exhaustive tests in our own high-power laboratories.

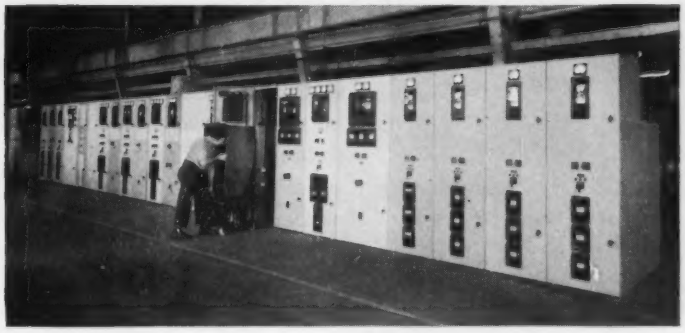
NEW 50-DH-75 BREAKER . . . Rated 75-mva interrupting capacity, 4.16 kv, 1200 amperes continuous, 5-cycle rated interrupting time.

NEW 150-DH-750 BREAKER . . . Rated 750-mva interrupting capacity, 13.8 kv, 1200 or 2000 amperes continuous, 5-cycle rated interrupting time.

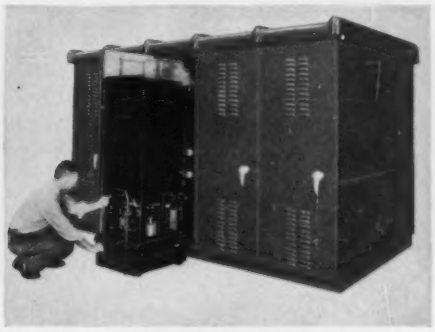
NEW 50-DHHS BREAKER . . . The new 2-cycle, high-speed breaker for 4.16-kv distribution circuits. Reduces wire burn downs and annealing. Rated 30,000 amperes interrupting capacity at 4.16 kv, 600 amperes continuous, 40,000 amperes momentary, 2-cycle rated interrupting time.

NEW 50-DH-350 BREAKER . . . Rated 3000 amperes continuous, 350-mva interrupting capacity, 4.16 kv, 5-cycle rated interrupting time. For heavy-current circuits.

Call your Westinghouse sales engineer or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60891



Standardized convenience . . . draw-out feature with this 50-DH-350 breaker, as with all Westinghouse air breakers, means quick, foolproof replacement, maximum accessibility.



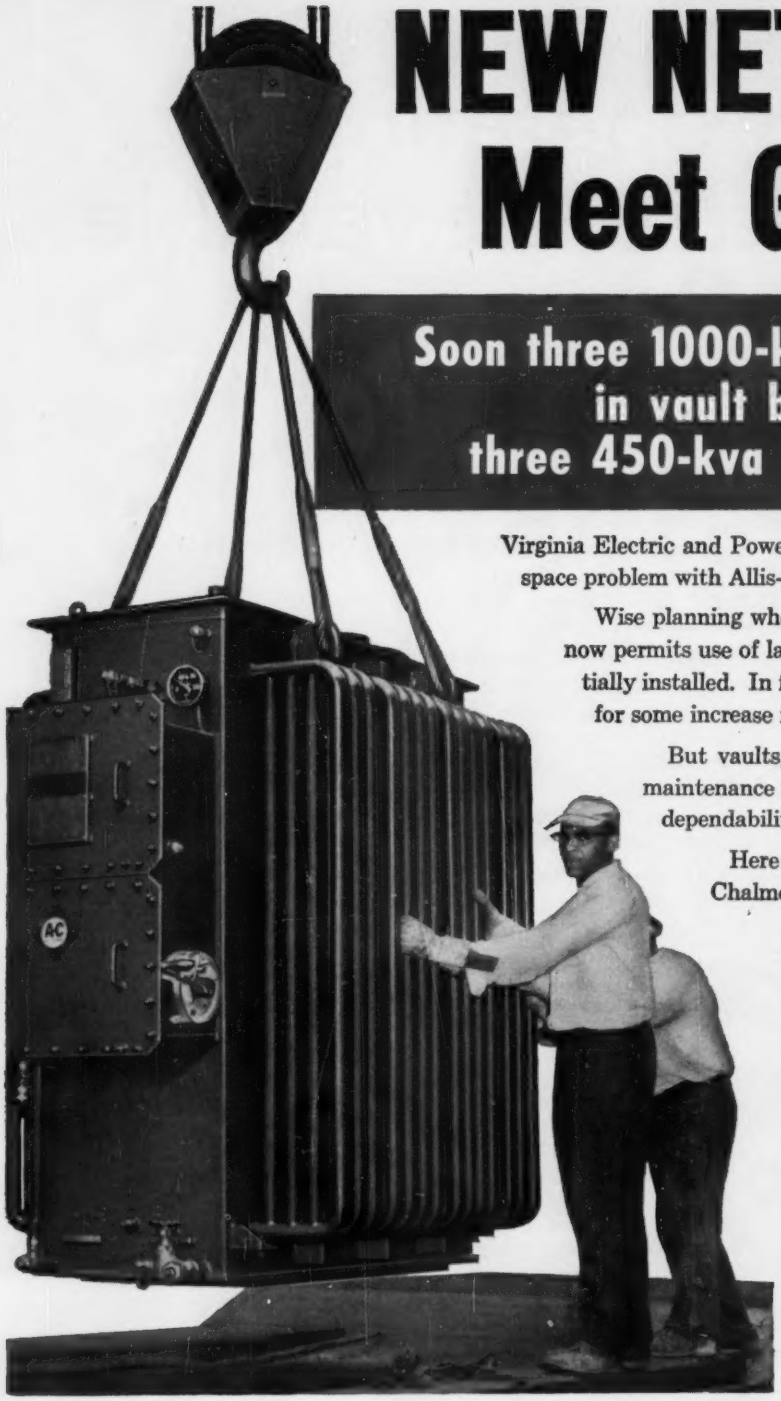
150-DH-750 air breaker for outdoor metal-clad switchgear in a large metropolitan substation.

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TELEVISION AND RADIO!

NEW NETWORK Meet Growing

Soon three 1000-kva transformers in vault built for three 450-kva units in 1934



Virginia Electric and Power Company solved a load and a space problem with Allis-Chalmers network transformers.

Wise planning when the vault was originally built now permits use of larger transformers than were initially installed. In fact, even today there is still room for some increase in transformer capacity.

But vaults, at best, are close quarters for maintenance men. This places a premium on dependability.

Here are some of the features of Allis-Chalmers network transformers:

- Thorough undercoating of tubes and base surfaces to protect against corrosion.
- Spiral-wound metallic gaskets—finest sealing of bushings in tank wall. They provide unusual resilience . . . can be installed without cements or grease . . . can be quickly removed if required and may be reused if needed.
- Compact, low-loss design.
- Solder-wiped threaded valve connection to tank.

Widely Used — **Nearly 1½ million kva of these units are in operation across the country. For more information, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.**

ALLIS-

TRANSFORMERS Needs in Richmond, Va.

This 1000-kva Allis-Chalmers network transformer is being lowered into Sixth Street sidewalk vault. It is alongside a 750-kva and another 1000-kva Allis-Chalmers transformer.

CHALMERS

A-C ALLIS-CHALMERS

A-4957

ENGINEERING MEMO FROM KAISER K/W WIRE

4.1

A K/W CONTRIBUTION TO THE INDUSTRY: It has always been our policy to contribute useful information to the electrical industry. This article, containing information published for the first time here, may prove helpful to utilities in their future operations. The article is in two parts: part 4.1 dealing with bare secondaries; part 4.2 dealing with weatherproof. Reprints available on request.

ALUMINUM AND COPPER IN SECONDARY DISTRIBUTION

BY NEIL BARR
CHIEF ENGINEER
ELECTRICAL CONDUCTOR DIVISION

To evaluate the acceptibility of aluminum conductor as an alternate for copper conductor in the distribution system, in this case specifically secondary, we have chosen four points to consider:

1. Characteristics which may be a factor in determining the spacing either horizontally or vertically when bare secondaries are considered.
2. Allowable span length of the two conductors when the same sag conditions are established.
3. The physical data, such as resistance, weight, strength, loading, etc.
4. Economics, which may include operating cost as well as first cost.

Aluminum vs. Copper for Bare Secondaries

If it has been established that bare secondaries will be used, the question of spacing has been settled and need not be changed if aluminum (ACSR) is used rather than copper. The reasons for this are:

1. ACSR can be installed in the same span lengths with the same or slightly less sag than its equivalent copper.
2. Since the sag in the two materials is the same, there is no greater danger of one conductor striking another.
3. If there is a strike, the fusing curves indicate that aluminum subjected to the same short circuit current will fuse in approximately the same time as its equivalent copper.

In the smaller AWG size conductors, such as #6, #4, and #2 copper indicated, it is ordinarily necessary to use ACSR rather than all aluminum to meet the necessary strength (sag) requirements. Comparing the maximum spans for copper, aluminum and ACSR, based on the listed sag limitations, an equivalent selection may be made.

MAXIMUM SPAN—FEET
HEAVY LOADING DISTRICT

STRESS LIMITED TO 50% OF THE BREAKING STRENGTH

Permissible Sag		Size and Type Conductor					
		#6	#4		#2	#1/0	
Sag Ft. @	Temp.–F	AWG Cu.	ACSR (6/1)	AA	Cu.	ACSR (6/1)	AA
2	60	134	180	95	202	238	130
2	120	121	155	85	170	180	100
3	60	152	201	111	235	294	156
3	120	141	190	101	202	250	132

With the sag limitations imposed above, it is apparent that in all cases the ACSR can replace copper, but that all-aluminum has more sag and cannot, on an equal sag requirement basis, be used for the same span lengths without exceeding the 50% design limit.

COMPARISON OF PHYSICAL DATA

SOLID WIRE	#6 HD Copper	#4-6/1 ACSR	#4 HD Copper	#2-6/1 ACSR	#2 HD Copper	#1/0-6/1 ACSR
Outside diam. (in.)	0.1620		0.2043		0.2576	
HD copper strength (lbs.)	1280		1970		3003	
D.C. resistance, ohms/mft @ 20°C	0.4108		0.2584		0.1625	
Wt., lbs. per 1000 ft.	79.46		126.4		200.9	
STRANDED CONDUCTOR						
Outside diam. (in.)	0.184	0.250	0.232	0.316	0.292	0.398
Strength (lbs.)	1228	1830	1938	2790	3045	4280
D.C. resistance, ohms/mft @ 20°C	0.4191	0.4137	0.2636	0.2602	0.1658	0.1635
R_{AC} @ 50°C	0.453	0.487	0.285	0.320	0.183	0.212
Wt., lbs. per 1000 ft.	81.05	57.4	128.9	91.3	204.9	145.2
Wind load on conductor with ½" radial ice, lbs/ft	Solid 0.3873	0.4167	Solid 0.4014	0.4387	0.4307	0.4660
Tot. conductor + ice and wind load, lbs/ft (½" ice, 4 lbs. wind + K)	Solid 0.9155	0.9794	Solid 0.9825	1.058	1.1098	1.154
Approx. current capacity, amps (2 ft. per sec. wind, 50°C rise)	121	140	167	180	226	230

From the above comparison of copper and aluminum it is evident that the physical properties of ACSR can fulfill the requirements of any systems which have been established using copper as the prime material.

Economics of Aluminum vs. Copper

In considering the economics of the system, one way is to break it down into two parts—one, operating and maintenance; two, fixed costs.

One of the prime operating costs is power loss charge. While the DC resistance of aluminum conductor steel reinforced is lower than the DC resistance of copper listed above, the AC resistance of copper is slightly lower than that of ACSR. In the sizes we are considering here, the ACSR AC resistance is a maximum of .035 ohms/1000 ft. more than copper and reflects a minute increase in secondary line conductor power or operating cost.

Another factor to consider here is the economic conductor selection combined with the size transformer to overcome either voltage drop or flicker voltage. While for a given load #4 aluminum may have sufficient current carrying capacity, #1/0 in combination with a smaller size transformer may prove more economical and power loss charges would be reduced.

Maintenance charges of ACSR should be approximately the same as charges against copper. While copper may be spliced by automatic type splices at a minimum labor charge, the higher strength of ACSR enabling it to fend off tree limbs should reduce the number of damages to the point where the charge for proper ACSR splices is approximately equal to or less than the copper repair charge.

The cost of poles, crossarms, insulators, tie wire, anchors, and labor is omitted from the comparisons, but should be the same regardless of whether copper or ACSR is used.

The above comparison does include the use of armor rods, mechanical deadends and aluminum connectors. Even considering these additional accessories, there are savings possible if ACSR is used rather than hard drawn copper. In short-span construction such as this, armor rods are not necessary but have been included to show that even if they are used, there is still an appreciable savings.

Conclusion

Aluminum conductor (ACSR) can be used as an alternate for copper in bare secondary applications for the following main reasons:

1. Aluminum may be installed with the same horizontal or vertical spacing as copper.

2. Span lengths allowable for ACSR, under identical sag limitations, are longer than those for equivalent size copper.

3. The AC resistances of the two constructions would result in almost the identical cost for loss power.

4. Even considering accessories necessary if ACSR is used, aluminum conductor costs less per 1000 ft. than copper.

(To be Continued)

* * *

During the electric industry's rapid expansion, Kaiser Aluminum has concentrated intensively on utility problems—with special emphasis on covered wire.

Today, Kaiser Aluminum is the nation's fastest growing producer of aluminum wire and cable, making available the latest helpful information on modern products and practices.

A Kaiser Aluminum representative or a K/W distributor will be glad to give you immediate attention. Call your Kaiser Aluminum sales office. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Bldg., Oakland 12, California; *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois.

FIXED COSTS

Prices Effective: Aluminum 3/5/56—Copper 2/21/56

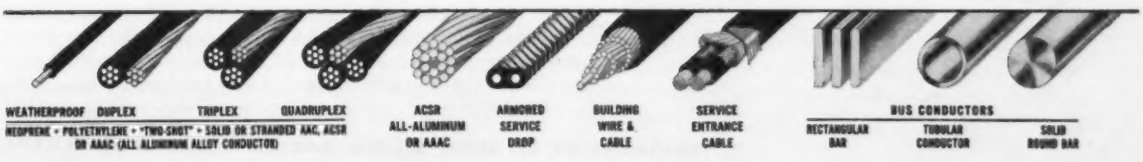
ESTIMATING COSTS ONLY

	#6 Solid HD Copper	#4-6/1 ACSR	#4 Solid HD Copper	#2-6/1 ACSR	#2-7 HD Cu.	#1/0-6/1 ACSR
Basic cost per 1000 ft. of bare conductor	44.03	20.32	74.45	30.59	116.61	46.90
Cost of copper dead-ends	—		—		—	
Cost of 3 ACSR dead-ends (loop type)		3.00		4.35		4.35
Armor rods (150 ft. spans)		2.70		3.72		7.50
Split bolt taps (4 per pole)	3.85	6.48	4.80	7.20	7.20	16.32
Total cost per 1000 ft.	47.88	32.50	79.25	45.86	123.81	75.07
Per cent conductor savings		53.8		58.9		59.8
Per cent material savings		32.1		42.1		39.4

Aluminum is the answer to Adequate Wiring

Kaiser Aluminum

THE NATION'S LARGEST PRODUCER OF ALUMINUM WEATHERPROOF WIRE AND TRIPLEX



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They're ready to design and engineer special transformers that meet your particular requirements best. When you consult Moloney's engineers, your problems are studied, enthusiastically tackled, and resolved expressly for your utility.

Call on Moloney engineers now! You'll get creative thinking backed by 60 years of engineering experience.

MEE6-22

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Transformers and Inductors for Electronics

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

The Task Force Is Good but Not Enough

Formation of its Technical Appraisal Task Force on Nuclear Power gets the utility industry off to a good start in its desire to accelerate development of nuclear power. It has been suggested that the force will only parallel or duplicate the development and appraisal work carried out by the Atomic Energy Commission and its contractors. Such is not the case. The task force can contribute something no other group in the country can—conventional power plant know-how.

This background will enable the task force to appraise properly the economic feasibility of new reactor concepts. Its members, second to none in ability and experience in this field, can go beyond the mere "paper" of a design study or the laboratory model. They will get the "feel" of how a new reactor concept would stand up against the day-in, day-out operational grind of power plant operation.

But formation of this task force is not enough. When Congress reconvenes, there will be another "Gore Bill." The utility industry's contribution to nuclear power will be put down as zero if this task force is all it can show.

At a press conference following its election, Donald S. Kennedy, Edison Electric Institute president, expressed the hope that utilities would band together in small groups on a geographical basis and construct the nuclear power plants the task force recommends. This hope must be turned into reality, and soon.

The utilities should of course inform the public that we are striving for quality as much as for quantity in nuclear power. Our multiple-reactor design approach is second to none in the world. But in the political atmosphere now surrounding the development of nuclear power, all progress is being measured in quantity; that is in kilowatts.

Manpower Expansion Needs Planning, Too

Equipment for tomorrow's expanded power industry can be bought in a comparatively short time. But manpower to run that expanded industry can't be bought; it must be trained over a long period. Leadtime for installing a generator is well established. Leadtime for acquiring and training skilled manpower is not. With a generator we acquire a finished product. With a recruit we acquire no more than raw material.

These are the reasons why industrial relations departments are getting greater recognition in today's plans for tomorrow's industry. Alert managements are realizing more and more that the most important resource in the industry is manpower.

Basic functions of the industrial relations department are to provide raw recruits, aid in training, and help work out incentives and conditions that will bring about a "better mutual understanding" between management and its employees.

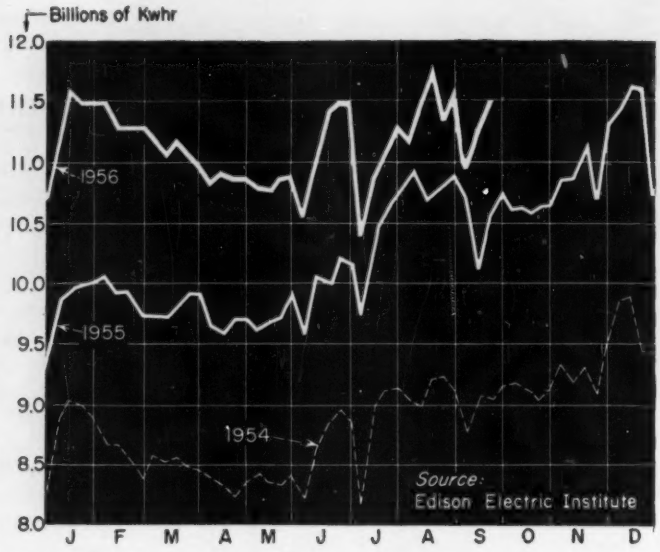
As today's problems have not all been solved, they are also tomorrow's problems. In addition, increasing automation will place more responsibility on the worker who of necessity must be of "higher calibre." Need for such workers will add to the burden of the industrial relations department. It must brace itself to hire the "right" employee—one who can be trained to handle more complex mechanisms—and then train him. To get the "right" employee will in itself demand skills little applied today.

The industrial relations department will also have to help pick the "right" supervisor—one who can be trained to handle men—and then train him. A good supervisor will welcome the challenge of leadership, but he will need help from the industrial relations department to do a better job.

In this training work, the department will use all of the aids of teaching. One handbook for utility personnel men should be the industry report, "Preparing Today for Tomorrow's Personnel Problems", beginning on page 59. This is indeed an up-to-date text on industrial relations. And as all good texts are the work of those who know, so is this. Its 29 authors are members of the Industrial Relations Committee of the Edison Electric Institute. Industrial relations is their daily job. From their broad experience and their large source of information they have prepared a report that should prove of value to the industry.

However advantageous a forewarning of tomorrow's problems may be, it will be wasted unless steps are taken now to solve them as they occur. Their solution will be as vital to the production, efficiency, and profits of tomorrow as the physical plant to which the electric utility industry always devotes such precise planning.

ELECTRICAL WEEK



OUTPUT

Week ended Sept. 22
11,482,000,000 Kwhr
Up 6.7%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 6.1%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Sept. 22	+6.7	+7.2	+4.3	+7.1	+5.6	+5.1	+11.8	+8.7	+6.9	+9.0
Sept. 15	+6.7	+8.9	+6.3	+8.8	+7.2	+5.1	+7.0	+7.4	+3.6	+5.8
Sept. 8	+7.9	+10.7	+9.4	+9.6	+9.7	+5.0	+13.0	+8.8	+4.0	+2.3

Seasonally Adjusted Index 219.8 Week Ago 215.8 Year Ago 205.9

Here are the issue's highlights: Fairman to head task force that will lead industry in accelerated development of nuclear power . . . General Electric boosts prices 10% on steam turbines; other manufacturers to follow suit . . . Despite Niagara Mohawk's acceptance of N. Y. Power Authority's proposal for Niagara Falls, a fight still may develop in Congress . . . Democrats try to pick bone with Power Reactor Development Corp, but are having trouble finding any meat on it . . . Moses Lake, Wash., taxpayer files suit to stop PUD from giving turbine order to English Electric for Priest Rapids project.

"Package" bill to speed atomic power development in the U. S. will be introduced in next session of Congress by Rep Melvin Price (D-Ill.). "Our national interest and international prestige", he told Atomic Industrial Forum, "require that we accelerate our reactor development program." The bill would provide for an accelerated government program and for government indemnity against private reactor hazards. These proposals, emphasized Price, are "not public power measures."

Routine operation of Bonneville Power Administration's 345-kv McNary-Ross line is slated to begin at design voltage today. The 175-mi line, for which successful test energizations were completed last month, will carry 320,000 kw from four McNary generators to load centers in Portland (Ore.) area.

Indiana PSC urges Securities & Exchange Commission to reject Public Service of Indiana's recent petition requesting SEC investigation of Indiana & Michigan Electric's proposed 450,000-kw, $58-million generating station. Public Service contends that construction by the American Gas & Electric subsidiary may violate provisions of Public Utility Holding Co Act. PSC claims issue affects only the state of Indiana, and also that construction "is in the best interests of consumers, investors, and the public generally."

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . U. S., Britain, and Canada agree to pool atomic patents for private nuclear projects, thus eliminating questions of patent infringement. Under agreement firms will need licenses only from their own governments for patents involved in pact . . . **Office of Defense Mobilization halts** tax amortization aid for copper producers following Interior Department report that annual supply target of 2.3 million tons, set in 1952, has been reached.

REA Administrator David A. Hamil urges electric co-ops not to criticize any member wishing to sell its system. "We are beginning to hear more talk of sell-outs," he told NRECA regional meeting. "We accept the right of a farmer or businessman to sell his property, yet actions of rural people are sometimes questioned when they decide to sell . . . their own rural power systems."

Arizona Power Authority asks postponement of proposed hearing on its plan to build a 30,000-kw state-owned steam plant in southern Arizona. Project is opposed by Arizona PS and other private utilities, which claim electricity from other sources exceeds state's needs, that the utilities have ability and experience to meet future needs, and that cost of power to APA would be the same from a state-owned facility or from PS's Saquaro plant, which at present is contracted to supply 30,000-kw to APA.

Toledo Edison system out 18 minutes. Momentary drop in oil pressure on a 125-Mw generating unit at the Bay Shore plant tripped off unit at 10:11 am Sept. 20. System was out 18 minutes before reserves and interconnections could restore partial service. Unit outage occurred during an investigative study of the Westinghouse machine which was put into service Aug. 31, 1955.

Kuhn, Loeb & Co, and American Securities Corp win $20-million Virginia E&P (Aa) first mtge 4⅛% bonds due 1986 with a bid of 101.548%; reoffer at 102% to yield 4.01%. Last time company sold bonds was June 7, 1955 when $20 million first mtge 30-year 3¼% bonds were offered at a yield of 3.20%.

Pennsylvania Electric Assn elects Robert P. Liversidge, Philadelphia Electric, new president. Vice presidents are Joseph O. Chambers, West Penn Power; Harry Ferguson, Penn P&L, and R. B. Donworth, Duquesne Light.

ABOUT PEOPLE IN THE INDUSTRY

American free enterprise is playing a leading role in generation of electric power from atomic energy, comments **James F. Davenport,** vice president-general manager, Southern California Edison. He advises electric companies to avoid a race for large volumes of atomic kilowatts and instead concentrate on research and experimentation with smaller plants to determine which types are most economical and reliable.

FPC hearings on controversial Mountain Sheep-Pleasant Valley dam construction by Pacific Northwest Power begin after five-week recess. **Pres Kinsey M. Robinson** may be recalled to stand by Hells Canyon Assn which contests PNP does not offer comprehensive development of the two-dam, $217,400,000 project on Snake River. PNP claims the 1,183,000-kw project is only one capable of relieving critical power shortage.

More News About People page 138

Dixon, Kennedy, Fairman Tell Press . . .

Industry Steps Up Atomic Effort

- **EEI names Fairman, five other utility executives, to industry task force to gather information, advise on nuclear power development**
- **Additional nuclear development groups are in the offing, Kennedy hints, following conference of 125 utility presidents in New York**

Electric companies are backing a stepped-up program for the development of nuclear power.

This was the overall policy charted at an all-day conference sponsored by the Edison Electric Institute and attended by the presidents and top executives of 125 electric companies.

To accomplish its objective, the electric companies will rely heavily on a newly formed Technical Appraisal Task Force on Nuclear Power headed by James F. Fairman, vice president, engineering, Consolidated Edison Co of N. Y. Principal functions of the Fairman group are:

1. To keep the industry informed of the status of research and development work, in the United States and elsewhere, of importance to the achievement of competitive nuclear power.

2. To study and report on all reactor programs and projects.

3. To study and appraise the technical and economic factors and the results to be achieved by the design and construction at different times of prototype or full scale nuclear plants.

4. To act as a liaison agency with the members of any nuclear reactor evaluation group that may be set up on a national level.

Serving with Fairman on the task force are James B. Black, board chairman, Pacific Gas & Electric Co; Walker L. Cisler, president, Detroit Edison Co; Philip Sporn, president, American Gas & Electric Co; William Webster, executive vice president, New England Electric System; and H. J. Scholz, president, Southern Services, Inc.

Independent nuclear scientists and engineers will be named to the task force in the near future. At least three prominent men in this field are being actively considered for membership with this group. Fairman said as many as five additional experts may be added. Outside consultants, engineering firms, and research organizations may be engaged from time to time to assist the task force.

Development Up to Companies

But while the task force will coordinate information and use its good offices to suggest and advise the industry on additional reactor possibilities, actual development will still rest with individual companies or groups of companies. Reporting on the EEI conference, Pres Donald S. Kennedy said men in the industry are "already talking about a second generation of atomic power plants." He said it was hoped that utilities would form groups divided according to small geographical area and develop reactors suggested by the task force.

"What types of reactors to build, how large, and where to build them will be the responsibility of individual utility management. We will advise," said Fairman, "but we don't intend to usurp the function of management.

Asked if public power groups might use the task force findings, Kennedy replied, "There'll be nothing secret about our findings, but I think that we would probably be working on units larger than those generally used by the public power groups." Edgar Dixon, chairman of the EEI atomic committee, saw it a little differently, "We may initially build smaller A-powered units to get experience," he told a press conference following the EEI meeting.

Several speakers at the conference urged a greatly expanded program of nuclear power development. Among them was Philip Sporn, who in an earlier speech had said the industry "may perhaps be inclined to be too pennywise in setting up our program for the long pull." Too many members of the industry are inclined to "let George do it," he told a West Virginia audience the previous week.

Prices Up 10% on Steam Turbines

GE puts higher list in effect Sept. 24, other makers expected to follow. Increase covers turbine generator units 2,500 kw and larger, other turbines, and gears. Six other turbine manufacturers give views

Electrical manufacturers last week began putting 10% higher price tags on steam turbine generator units and other pieces of large electrical equipment. This was the delayed-action boost, resulting from higher steel prices and increased labor costs, which had been expected for several weeks (EW, Aug. 27, p 56).

For electric utilities, the price hike will add upwards of $24 million in costs if applied only to generating equipment still to be ordered for 1959 installation. Of the 15,354,000 kw of steam generating capacity to be added in that year, slightly more than 5 million kw is already on order.

First break in the price line for heavy equipment was made by General Electric Co which announced a 10% price increase effective Sept. 24. The increase covers steam turbine generator units 2,500 kw and larger; mechanical drive turbines 5,001 hp and larger, and speed increasing and reducing gears. GE cited "increases in material and labor cost" as reason for the price change.

An Electrical World check of other steam turbine manufacturers indicated that similar action is imminent on a broad industry scale. Here is the rundown:

Westinghouse Electric Corp: Manufacturing costs are being reviewed and an announcement is expected in next few days.

Allis Chalmers Mfg Co: "We have not as yet completely evaluated the impact of price increases. We are examining our situation and as we are able, we will adjust our price schedule to conform to cost increases."

Worthington Pump & Machinery Co: "We are seriously considering a similar increase."

De Laval Steam Turbine Co: An increase is certain in the very near future.

Elliott Co: Repricing studies are now underway on large water wheels and other slower moving items. Inevitably, there will be an increase on these items—probably around 8-10%.

Brown Boveri Co: "We have had no word from our parent company that price adjustments are being considered. We usually get an advance notice of two or three weeks."

Is Niagara Power Fight Off or On?

Niagara Mohawk agrees not to contest N. Y. State application for federal license, but the five companies are free to carry fight for their plan before Congress

Here's how the battle for development of an additional 2 million kw of power at Niagara Falls stands today:

If the New York State Power Authority can get a federal license for the development, the five leading electric companies which have an alternative plan probably won't contest the license.

If not, they'll press Congress for an okay on free enterprise development at the Falls.

An agreement reached between the Power Authority and Niagara Mohawk Power Corp is the new element in this six-year-old fight between public and free enterprise bodies for the giant hydro project.

Main Points in the Agreement

The three main points in the recent agreement are:

1. Niagara Mohawk will make available water-use rights assigned to its severely damaged Schoellkopf plant. These rights would be used at a much larger downstream plant proposed by the Power Authority.

2. In return, the Power Authority will make available to Niagara Mohawk 445,000 kw of capacity from the downstream plant for 40 years.

3. Consummation of the agreement hinges on the Authority's ability to acquire the federal license. Niagara Mohawk will not contest the constitutionality of the license, but has specifically reserved the right to seek Congressional approval of a free-enterprise development of the Niagara power by the five leading utilities in the state.

By seeking an FPC license for the Niagara project, the Power Authority is challenging a reservation in a 1950 treaty with Canada. When it ratified the treaty, the U.S. Senate directed that Congress decide who would carry out the power-development project on the U.S. side of the Falls. The Power Authority contends that this rider is not legal. Thus it is going to FPC for a license under terms of the Federal Power Act.

Basis for the Utility's Stand

In agreeing to trade its water-use rights for a long-term power contract, Niagara Mohawk acted on the assumption that it had little choice in the matter. If the Power Authority theory is correct, then this state agency has priority over any privately owned company in obtaining a license. Furthermore, Niagara Mohawk recognizes the technical and economic advantages of transferring its water-use rights to a downstream project which affords an additional 100 feet of head.

On top of this, the loss of the Schoellkopf plant June 7 forced Niagara Mohawk to turn to Canadian utilities for power to serve industrial customers in its area. This higher-priced power necessitates a rate increase which the customers are hotly contesting.

Politics: What's Brewing in Oregon?

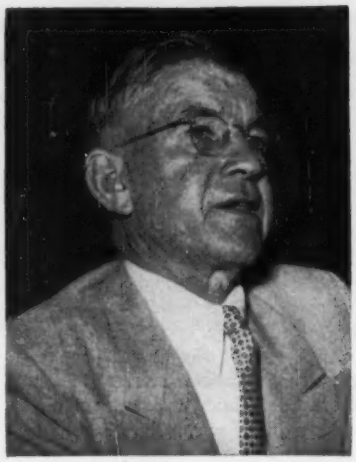
A curious stew involving Morse, McKay, power, and worried saw mill owners

Is power really an issue in the Oregon political campaign? EW's correspondent wired the following report on the situation:

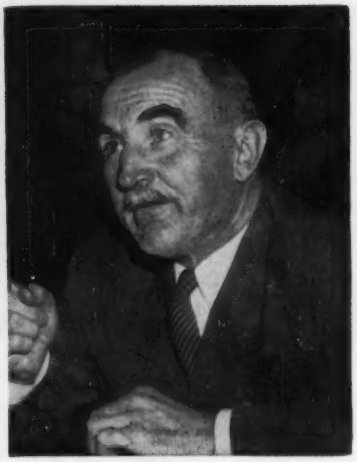
Here's what's at stake in Oregon: Peace, prosperity, and Wayne L. Morse's avowed independence. Power issues are taking a back seat.

The voters must choose between Sen Morse—who changed political colors and whose views clash with philosophies held by investor-owned utilities—and his long-time political foe, Eisenhower's former Secretary of the Interior Douglas McKay.

A door-to-door pre-election canvass, remarkably accurate in the past, discloses little feeling about the many so-called issues which each candidate has seemed to think important. No one seemed particularly concerned about who provides power in Oregon, although the word "partnership" seemed to ring a bell. The few comments received on the power issue simply stated that "Oregon needs more of it."



McKay: Still a Republican



Morse: Now a Democrat

Both candidates refer occasionally to Hells Canyon, John Day, Cougar, and Hills Creek—symbols of their divergent views on resources development. Said Morse: "I will help a private utility build a low-head dam on a low-head site, but a multi-purpose dam should be developed by and for the people. . . ." But critics point up his opposition to such relatively low-head structures as Green Peter and nearby Cougar. Originally these formed part of a series in West Oregon authorized for flood control purposes.

Meanwhile, McKay has been praising the GOP's efforts "in getting government out of those fields that the people themselves can do better, more economically, and at less tax cost. . . . The Republican party begins with the premise that the federal government cannot do it all without eventually regimenting our lives," he philosophized.

McKay also has thumped on prosperity, but Morse has charged that Eisenhower's "hard-money policies" have depressed house construction. This worries Oregon's saw mill operators and workers who turn out more lumber for house-building than any other state.

Only rabid partisans are plunking down cash in wagers on the November Senatorial race.

PRDC Defends Atom Plant

The Democrats would dearly love to make another Dixon-Yates case out of the Power Reactor Development Co controversy over the safety of the proposed atomic power plant. If they fail, it won't be for lack of trying, but for lack of meat on the bones they are chewing.

The flimsiness of the case is pointed up by the reply filed by PRDC to the petition of the AFL-CIO unions for a hearing on the reactor's safety and suspension of the preliminary construction permit.

In the same vein was the recent six-page letter from Sen Pat McNamara (D-Mich.) to PRDC Pres Walker Cisler, which cited virtually every public power argument ever made against private companies participating in atom power activities.

When Atomic Energy Commission issued the preliminary construction permit to PRDC for the $54.5-million Enrico Fermi atomic power plant at Lagoona Beach outside Detroit, it was heavily conditioned upon solution of certain safety questions. AEC made it clear that no operating license would be issued if these questions are not solved. Designers of the plant are confident that the technical problems can be solved.

Cause of all the furor—the safety report of the Advisory Committee on Reactor Safeguards—itself recognized the time element ignored by critics. The report said there was insufficient information available "at this time" to give assurance of safety.

But, as PRDC pointed out in its reply to the petition:

"Refusal to grant the request of the unions can have no conceivable effect upon the health or safety of the public, as the activities in which PRDC is presently engaged . . . are related solely to preparation of the construction site, design and procurement of mechanical components . . . and continued research.

"No fissionable materials are employed . . . and none will be until applicant is granted license to operate the reactor plant, which will not be earlier than Dec. 1, 1959."

AEC now has to decide whether or not to call a hearing. Should it decide against the hearing, PRDC critics will have a field day. At best, it might postpone a decision until after the election.

IES Marks Golden Anniversary

Delegates to Boston meeting hear prediction for next 50 years, and current trends

Illumination Engineering Society's 50th anniversary meeting drew 1,000 persons to Boston for a technical conference which heard this forecast for the industry: In the next 50 years, power production will hit 11 trillion kwhr. In the U.S., requiring a generating capacity of 2,500 million kw, each year more new capacity must be built than today's entire 122 million kw. Fifty years hence, most power was predicted to come from atomic power plants.

Delegates were brought up to date on research involving increased lighting needs of older workers which could be satisfied without endangering younger eyes. They heard about the new high-intensity electronic flash approach runway lighting system that minimizes the hazardous effects of fog at airports.

They talked about the role of lighting in curbing highway accidents and urban street crime. Good street lighting value was documented by the statement that a relighting program in a Boston suburb is worth three to five police prowl cars.

A trend toward low-mounted auto headlights seems to be coming. Such headlights "sneak" their beams under a fog curtain, yielding better visibility. A four-headlight system also is being perfected. Two lamps cast "distant" beams, and two deliver "passing" beams.

SYMBOLIZING PROGRESS, this 37-ft-high pylon stood in the Boston night, illuminated by 7,500w. Actual progress is shown at right by lamps held by R. B. Jones, Boston Ed; R. F. Hartenstein, IES president; and M. N. Waterman, pres-elect. The lantern is one of the original two hung in the North Church tower for Paul Revere. Replica of Edison's incandescent lamp contrasts with current model

Other subjects covered: Daylighting, lamp design, residence lighting, interflection problems, mercury floodlighting, light sources, and problems of the related manufacturing industry.

Delegates were welcomed by Thomas G. Dignan, president, Boston Edison Co, and were steered through the program by IES Pres R. F. Hartenstein and Pres-Elec M. N. Waterman. At a convocation, Dr George S. Crampton was presented with the rarely bestowed IES Gold Medal, and Dr Irving Langmuir was accorded the highly prized Certificate of Honorary Membership. Both are renowned scientists in the illumination field.

The 1957 technical conference will be held in Atlanta, Ga.

NEWS IN BRIEF

ATOMIC

First successful operation of electronic components for control of an atomic reactor at high temperatures and in high-intensity nuclear radiation for more than 1,000 hours has been demonstrated at General Electric Co's Aircraft Nuclear Propulsion Department . . . **Union of South Africa** plans to investigate possibility of establishing an atomic power station in Western Cape Province. Decision to switch to the slightly higher-priced fuel is based on Cape Town's distance from coal sources in the north, with resulting burdens to the railways.

Atomic Energy Commission's **International School of Nuclear Science** and Engineering has accepted 63 students for graduate studies, 50 of them from foreign nations. The school, established by Argonne National Laboratory last year as part of the Atoms-for-Peace program, provides unclassified studies in reactor technology pending establishment of similar facilities in educational institutions here and abroad.

"Power reactors of the Calder Hall type (fast breeder) are capable of a great deal of improvement by engineering development," predicts Sir John Cockcroft, director of Britain's Atomic Energy Research Establishment. With major improvements and reduced cost within 10 to 15 years, he says, nuclear power will be "making a major contribution to Britain's economy a decade from now."

HYDRO

McNary Dam's 13th generator entered power production recently, leaving only one 70,000-kw unit for completion in December . . . Federal Power Commission has granted Massachusetts Commonwealth's requested postponement until Oct. 15 of a hearing on the state's bid to share **St. Lawrence power.** Massachusetts, contesting New York State's refusal to grant it a power allocation, seeks 250,000-kw per year or one-third of the project's output. Opposing this allocation are New York

(*Continued on page* 151)

4.16 Kv Does Job for Large-Unit

GENERATION
Design

Auxiliary voltage serves economically for large supercritical-pressure plants, according to study's findings

A. C. DOLBEC, J. J. HEAGERTY, A. G. MELLOR, Application Engineers, Engineering Planning and Development, General Electric Co, Schenectady, N. Y.

Now is the time to plan auxiliary system arrangements for generating units as large as 600,000 kw, with steam pressure as high as 5,000 psig, which in all probability will be in use in the next several years. The authors' study of steam station auxiliary systems for large high-pressure turbine generator units indicates that:

1. It is more economical to keep the auxiliary system at 4.16 kv, whether through the use of more buses or of 4.16-kw switchgear with higher interrupting ratings than to use a higher-voltage system.

2. Based on estimated costs of a proposed 4.16-kv, 350-Mva breaker, the costs of a two-bus system with this breaker are about a standoff with a four-bus system with 4.16-kv, 250-Mva switchgear.

3. Two-stage pumping (series stages), or motors in tandem for driving a boiler feed pump fit well into the design of an auxiliary system with four buses.

4. Split low-voltage winding transformers offer an economic gain.

5. Selective throwover of motors during an emergency operation extend the use of a particular rating of switchgear.

6. Induction motor contribution to interrupting duty should be considered.

4.16 Kv Desirable

Total auxiliary power requirements increase with unit sizes, and boiler feed pump requirements with pressure. Because larger units will operate at higher pressures, auxiliary power requirements will increase rapidly, boiler feed pumps representing a larger proportion of the total auxiliary load. Economy makes keeping the system at 4.16 kv desirable.

Consequently, the designer's problem is to provide adequate voltage during startup of the largest motor and for bus throwover, while keeping duty within switchgear limits.

On station auxiliary systems momentary rather than interrupting duty on switchgear is usually limiting. The auxiliary load is almost entirely induction motor load, and these motors contribute greatly to momentary duty. As their contributions decay rapidly, the motors contribute a far lesser amount at the time the breaker interrupts. Various methods of decreasing the momentary duty have been used in this study.

Also considered were these two voltage-drop conditions:

1. On starting the largest motor.

2. On throwover of an auxiliary bus where the source of power is interrupted.

Voltage dip on starting the boiler feed pump was limited to a maximum of 20%, in most instances about 15%.

The study assumed that on routine bus transfer normal and reserve sources would be momentarily paralleled. Hence, voltage dip was not a problem. While both sources are briefly paralleled, the feeder breakers may be subject to overduty. But probability of a fault during this period is slight, and many utilities operate today in this manner.

On emergency bus transfer only auxiliaries needed for safe shutdown or fast startup were considered to be thrown over. The study assumed that a boiler feed pump, an induced and forced-draft fan, a condensate, and a circulating water pump were thrown over. A voltage relay on each bus initiates throwover when residual voltage on that bus drops to 25% of normal. Allowing such a drop reduces shock to the motors. Voltage dip that would occur, were all selected motors thrown over together, was limited to not more than 25%. On systems using more than one, the buses probably would not throw over at the same instant, such diversity of course, lessening the voltage dip.

Sometimes residual voltage cannot be allowed to decay to 25% because adequate boiler control could not be assured. Such situations may necessitate a non-delay transfer. When such transfers are confined to truly emergency automatic operations, experience indicates that motors can be expected to give reasonable service.

Some utilities transfer 100% motor load on all bus transfers. This procedure requires low start-up transformer impedance to keep voltage drop within acceptable limits. Formerly, when units were not too large, this was done without exacting any large cost penalty. Such operation boosts the duty which switchgear must be capable of withstanding. Involving larger unit sizes, such operation could require higher rated switchgear, thus adding considerably to auxiliary system costs.

Voltage Dip Calculated

The authors calculated voltage dip from selected motor throwover with initial motor loads included. Systems using a split, low-voltage winding start-up transformer maintain voltage levels on a load on one winding while absorbing the motor throwover on the other. They do this without additional voltage penalty. But Systems 1 and 4 have two auxiliary systems connected together at the start-up transformer secondary with no impedance between them. Any running load increases the total voltage drop. Accordingly, the start-up transformer impedance was reduced on Systems 1 and 4 to hold the same total voltage drop allowed on other systems.

The study extended to circuit breaker duty. The limiting circuit breaker duty depends on the maximum number of motors connected at the time of fault. Auxiliary system faults during normal operation are fed by the system through the normal auxiliary transformer and by the induction motors connected to the auxiliary system buses. But, when a fault occurs while the auxiliary sys-

Adapted from a paper presented by the authors at the fall general meeting of AIEE, Chicago, Oct. 1-5.

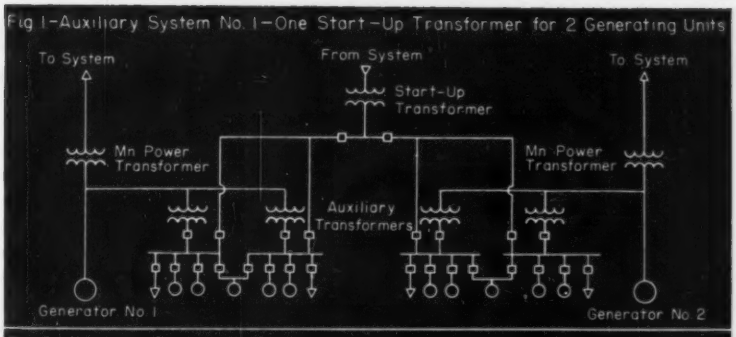
tem is fed from an emergency source, the short-circuit current can be a maximum.

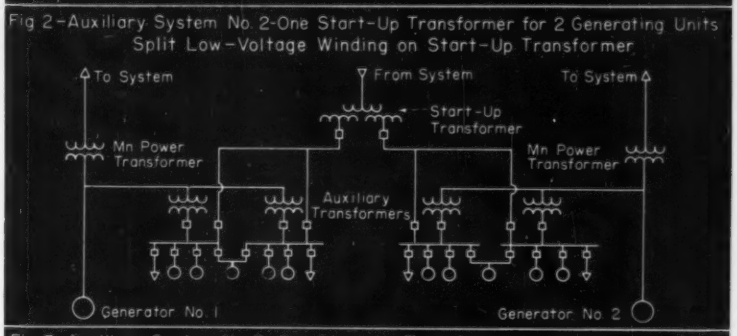
Fault Current Found

As an example, maximum duty on System 4 combined the system short-circuit current contribution through the start-up transformer, all motor short-circuit current contribution from one unit, and the contribution from the auxiliary motors of the unit being started. Its total fault current amounted to the system contribution through the start-up transformer, plus 150% of the contribution of one unit's auxiliary motors.

Induction motor contributions are shown in Table I as a percentage of one unit's full auxiliary load for maximum contingency fault conditions. For these conditions fault current was calculated for each system, and breakers were rated accordingly. Although in all cases the breaker momentary rating limited the application, systems with multiple auxiliary buses caused the short-circuit current decrement to flatten, the point being reached in System 3 where both momentary and interrupting duty limited application.

Short-circuit duty was determined in this manner. The symmetrical ac component of short-circuit current was calculated at zero time and included all induction motor contributions. The value of symmetrical ac current was multiplied by 1.5 to obtain the momentary duty. In calculating the interrupting duty of breakers, induction motor contributions are normally neglected. As the fault current from large induction motors persists for several cycles, however, the symmetrical ac current calculated at zero time, including induction motor contributions, was used for the in-





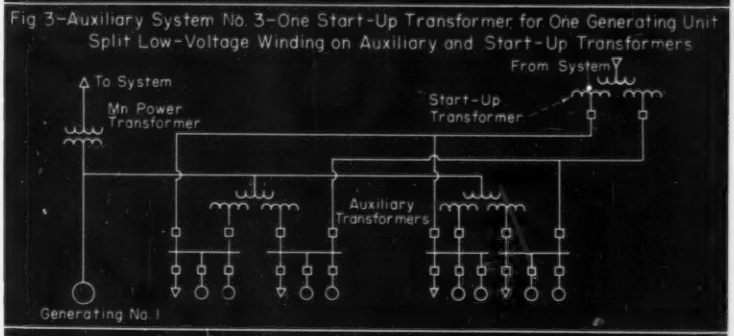
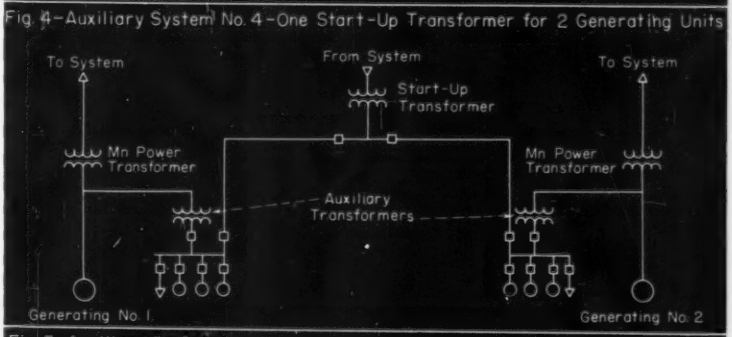


Fig 3-Auxiliary System No. 3-One Start-Up Transformer for One Generating Unit Split Low-Voltage Winding on Auxiliary and Start-Up Transformers
From System
To System
Mn Power Transformer
Start-Up Transformer
Auxiliary Transformers
Generating No. 1



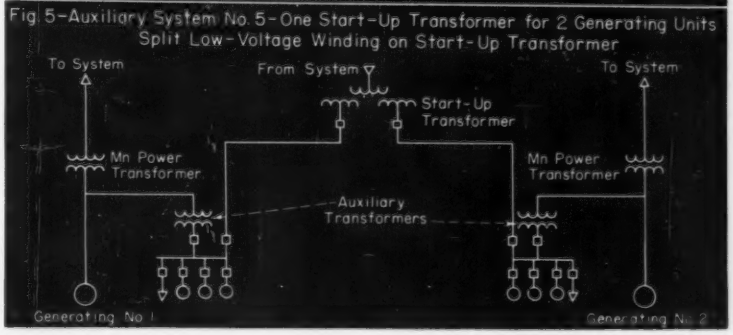


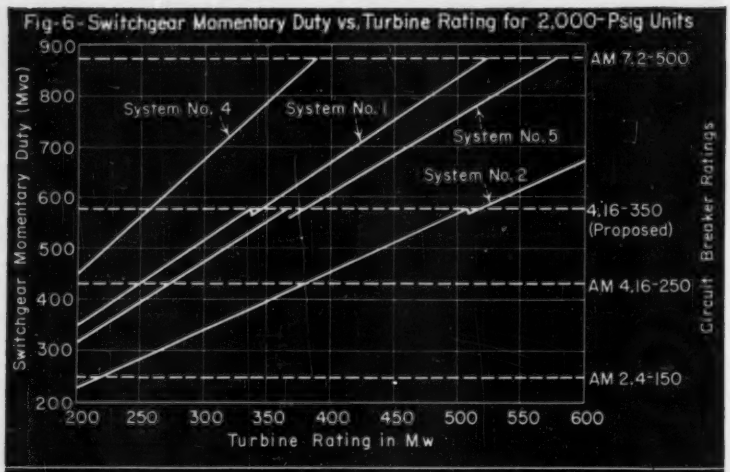
FIG 1-5 show auxiliary systems investigated. System 1 might be considered today's conventional one for large units. System 2 has split low-voltage winding on start-up transformer. Latter limits motor contribution. System 3 has split winding on start-up and auxiliary transformers and uses one start-up per unit. System 4 uses one start-up with two units and one auxiliary transformer per unit as has been prevalent with smaller units. System 5 is like System 4, except that it has split low-voltage winding in the start-up transformer.

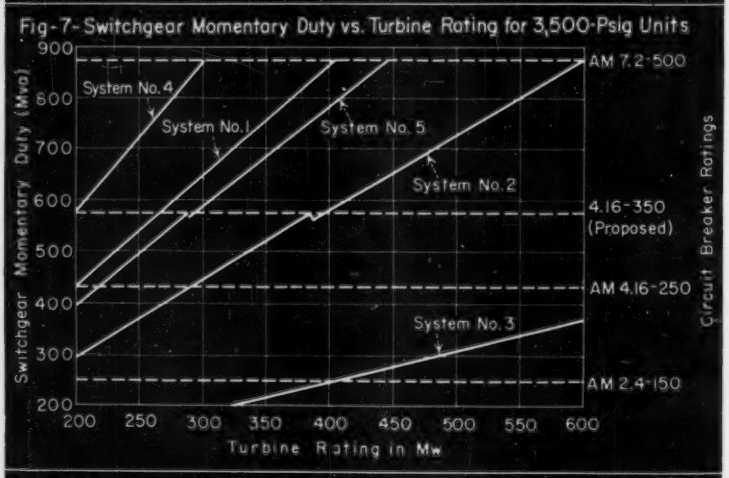
terrupting duty on the breakers. Several more detailed calculations of the actual interrupting current indicated that using the initial symmetrical ac current as the current that must be interrupted gave conservative results. Even with motor contributions at time of interruption considered, momentary duty was still limiting. Besides the short-time ratings, breakers must be applied to carry the continuous currents shown in Table II.

The study was based on these assumptions:

1. For calculating switchgear duty and sizing the boiler feed pumps, these percentages were used:

For 200-psig units auxiliary power requirements were 5.7% of maximum turbine rating, and





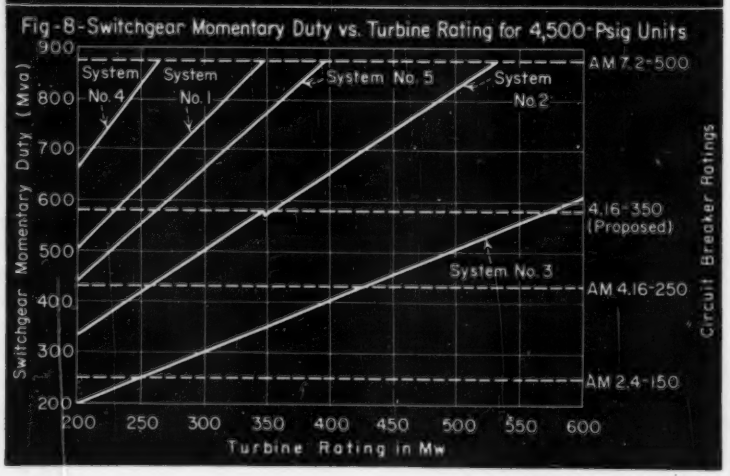


FIG 6-8 show momentary duty vs turbine rating for each auxiliary system and turbine pressure. Also plotted are Mva momentary breaker ratings for AM 2.4-150, AM 4.16-250, AM 7.2-500, and proposed 4.16-kv-350-MVA interrupting rating circuit breakers. Momentary ratings, actually in amp, were multiplied by $\sqrt{3}/10$ 6 x rated breaker line-to-line voltage for 3-phase Mva. Each system allowed a different total short-circuit current depending on system configuration. Maximum short-circuit current is on System 4 (one bus). Split low-voltage winding start-up transformer was substituted on the one-bus arrangement and short-circuit duty reduced, as shown on System 5 curve. Duty on System 1 fell between that calculated for Systems 4 and 5. Although System 1 (two-bus) has same induction motor contribution as System 5, initial induction motor loads required start-up transformer to have lower impedance than System 5 for same throwover voltage drop. Hence duty on System 1 was slightly more than on System 5. Split low-voltage winding start-up transformer applied on System 1 was next step in reducing switchgear duty. Configuration is labeled System 2. These steps are logical improvements to reduce short-circuit currents and may be extended. Further reduction in switchgear duty would come from use of 3-bus arrangement. System 3 (4-bus) is a possibility for very largest units at supercritical pressures.

At 2,000 psig steam pressure switchgear duty on 300-Mw unit auxiliary system required 7.2-kv breakers for System 4, proposed 350-Mva breakers for Systems 1 and 5, and was within present 4.16-kv switchgear duty for System 2. At this pressure Fig 6 indicates a unit as large as 380 Mw may use 2-bus, split low-voltage winding start-up transformer type of auxiliary system and remain within 4.16-kv-250-Mva switchgear ratings. When 3,500-psig turbine pressure was considered, 4.16-kv-250-Mva switchgear momentary ratings were exceeded for System 2 beyond 290 Mw; at 4,500 psig, for a unit larger than 260 Mw. System 3 was a possibility for ratings as large as 430 Mw at 4,500 psig and larger than 600 Mw at 3,500 psig. Curves show system for very large supercritical pressure units can be built at a saving using 4.16-kv switchgear.

Table I—Induction Motor Contributions to Fault Conditions

(Contributions given as percentages of one unit's full auxiliary load for maximum contingency fault conditions)

System	Per Cent
1	100
2	50
3	25
4	150
5	100

Maximum contingency on a start-up transformer connected to two units was:

Unit No. 1—One auxiliary bus could not be supplied from the normal source and was connected to the reserve source.

Unit No. 2—Half the full auxiliary load was required to start the unit.

Table II—Metal-clad Circuit Breakers Must Be Applied to Carry Continuous Current

Operating Voltage	Interrupting Rating-Mva	Continuous Amp Rating	Maximum Kva Per Bus at Operating Voltage
2,400	150	1,200	5,000
2,400	150	2,000	8,330
4,160	250	1,200	8,650
4,160	250	2,000	14,450
4,160	350*	1,200*	8,650
4,160	350*	3,000*	21,660
7,200	500	1,200	15,000
7,200	500	2,000	25,000

*Rating of a proposed circuit breaker.

Table III—Installation Charges of Equipment

(Given in per cent of equipment cost)

Item	Per Cent
1. Start-up Transformer	20
2. Normal Auxiliary Transformer	20
3. Motors	15
4. Cable (from switchgear to motors and from transformers to switchgear)	100
5. Switchgear	35
6. 230-Kv Disconnect Switch	100
7. Isolated-phase Bus and Disconnect Switch	10

Costs for equipment normally used at 480 v were not included because the cost of this equipment would be the same regardless of system.

Fig. 9-Cost Comparison of Auxiliary System for One Unit

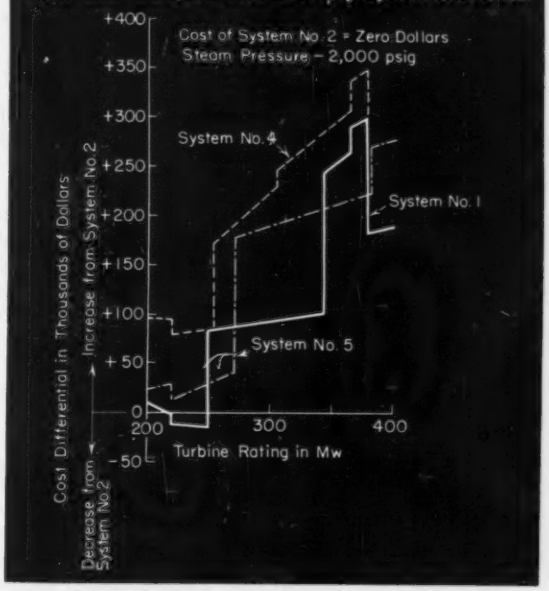
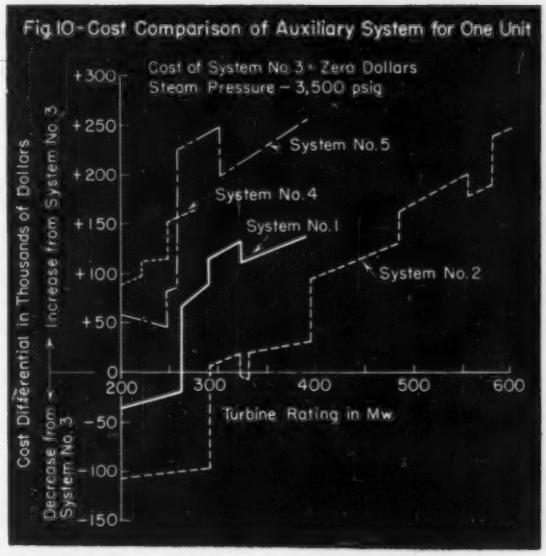


Fig. 10-Cost Comparison of Auxiliary System for One Unit



boiler feed pump power 37% of total auxiliary power.

For 3,500-psig units auxiliary power requirements were 7.5% maximum turbine rating, and boiler feed pump power was 53% of this power. Single-stage series pumping was assumed for the feed pump, and on the four-bus system two motors in tandem were used for driving each feed pump.

For 4,500-psig units, the auxiliary power requirements were 8.35% of maximum turbine rating, and feed pump power was 59% of this. Two-stage series pumping was assumed for the boiler feed pump.

2. For systems where one start-up transformer fed two units, switchgear duty was a maximum when the start-up transformer fed the bus of one unit under an emergency condition, and also had to start the second unit. Under emergency operation a bus would be carrying its normal load, and under startup, 50% of the motors for full-load operation.

3. Wherever the systems were utilizing 2.4 and 4.16-kv switchgear, 90% of the load was at 2.4 or 4.16 kv and 10% at 480 v. When the 7.2-kv breaker was used, only the boiler feed pumps, induced-draft and forced-draft fans, and the exciters were at the higher voltage. All other motors were at 480 v. This arrangement was more economical than putting 90% of the load at the higher voltage.

4. Demand factors were 0.9 for boiler feed pumps and 0.75 for the

(*Continued on page* 151)

Floating Kw's Sail Again

The Navy's "floating power plant" has been leased by Florida Power & Light Co to provide power insurance while major installations are under way at the Ft. Lauderdale steam plant. Capable of generating 44,000 kw, the YFP-10's steam-turbine generators are housed in the hull of a converted wartime freighter (the Coastal Racer) and will come to FP&L from the Gibbs yards in Jacksonville. The ship will be tethered at Port Everglades.

Future Generators . . .

The size and shape of generators to come may be foretold by the No. 4 unit going into Cleveland Electric Illuminating Co's Eastlake Station. This machine has liquid-cooled hollow stator conductors which endow it with 75% more capacity than a conventionally cooled generator of the same size would have. The cooled stator bars in the 260 Mva unit can carry three times more current than present day stators.

A gas-gap pickup method of cooling the rotor also is an innovation. Small holes, cut at an angle in the rotor, scoop up hydrogen gas and force it into hollow copper windings. General Electric Co predicts that improved cooling, linked with other engineering refinements, in the future will yield a 100% increase in KVA output without appreciable increase in generator size.

Other cooling features of the Eastlake unit: Oil cools the 275-Mva transformer and switchgear. Cold water from Lake Erie cools the transformer oil in hermetically sealed heat exchangers, and cools also the station's condenser. Hot steam is piped through the turbine to cool some parts that are even hotter. Air cools the main buses.

Who Owns Con Ed?

"Who do you think owns and operates Con Edison?" This question was put to the public by a research organization. The findings: 24.4% of those asked didn't know; 6.9% thought city, state, or federal government owned and ran the New York utility; 68.7% replied "private investors." Con Ed said it was surprised at the number of people who didn't know the answer.

In Lieu of Telephones

When management of Ohio Consolidated Telephone Co shut down its exchanges and brought telephone service to a halt on the night of Sept. 18, Ohio Power Co jumped to the task of setting up immediate make-shift communications in the area.

Through radio and newspaper ads, it advised the public to report need for service to the nearest collecting agency. Service men visited the 10 agencies twice daily to pick up requests. By the next morning, printed instructions were ready for commercial and industrial customers, informing them where they should go for emergency electric service.

The utility used automobile messenger service to carry messages from its Portsmouth headquarters to its high-line office at suburban New Boston, where they could be put on the communication line to company headquarters in Canton.

During the four-day absence of telephone service, the company maintained standby emergency service crews on an around-the-clock basis. The crews could be dispatched via an emergency radio system established by the Portsmouth police department.

Fast Response

A Tacoma, Wash., City Light offer to help home owners rewire their houses for electric ranges and water heaters brought almost 500 responses in three months. City Light pays $50 toward rewiring costs where flame-type or sidearm water heaters, and flame-type kitchen ranges, are replaced with automatic electric appliances. In the first three months of the drive, 124 homes switched to electric water heaters, 247 converted from sidearm to automatic water heaters, and 128 put in new ranges.

Taxpayer at Work

A Moses Lake, Wash., taxpayer has filed suit in Grant County Superior Court to stop the PUD from buying American-made turbines for its Priest Rapids project. Evarst C. Olander said that transferring the turbine order from English Electric Co to Allis-Chalmers Mfg Co would add $975,000 (the PUD says $500,000) to the $91-million project. The PUD defended its action by pointing out that English Electric had never built turbines of the size required for the project (280-in. diam).

Now the PUD says it will stand by the original order with English Electric rather than risk construction delay while the taxpayer's suit is being litigated.

Air Conditioner Sales Up

Despite a cool summer in many parts of the nation, room air conditioner sales are running ahead of 1955. By the year's end, sales may hit 1.5 million units, in contrast to last year's 1.3 million, reports George S. Jones, Air Conditioning & Refrigeration Institute's managing director. The gain is traced to June, because cooler-than-usual July and August pulled sales down.

INDUSTRIAL RELATIONS REPORT

Preparing Today for Tomorrow's Personnel Problems

1 The Employee – "It is no longer sufficient for an employee to be trained for today's tasks. He must also be trained to take full advantage of the new techniques and procedures which will confront him tomorrow."

H. L. BOWEN

2 The Supervisor — "At all times he gives his group the kind of leadership which results in full production and high morale, and he is a rallying point in time of crisis."

S. L. LEAHY

3 The Labor Organization — "The major problems with which we will then be concerned, and for which we must prepare the labor organization, are those related to productivity and efficiency."

E. J. THIMME

4 The Industrial Relations Organization — "Unless utilities are to lag behind, their industrial relations departments must organize now to cope with the complex analyses of human behavior."

F. L. LARKIN

9 Problems to Be Solved

A careful look at these problems should be taken by personnel managers today in light of developments expected tomorrow

C. B. BOULET, Vice President-Personnel, Wisconsin Public Service Corp, Green Bay, Wis.

Optimistic forecasters see a bright tomorrow for the electric industry. They see expansion of physical properties and growth of investment and increase in kilowatt hour output far beyond anything the industry has experienced in its rapid rise to a place of prominence in the American economic picture.

But beyond all this they envision a new civilization stemming from new and broader uses of electricity in industry, in commerce, and in the American home.

Realization of these dreams will make this industry the keystone of the national economy. The bright promise of more leisure hours, the highest standard of living the world has ever known, better health and longer life, higher and higher levels of production, and the full fruits of free enterprise rest on the capacity of the electric industry to meet the demand of tomorrow for a plentiful supply, dependable service, and low cost of its products.

Management has come to realize with each succeeding year that the most important resource in the electric utility business is manpower. While technical improvements give results in higher output per individual employee, no replacement has yet been found for the men needed to operate and maintain new and complicated machines. The problems of manpower will continue to face the industry in the years ahead. It is wise and good business to take a careful look at some of the specific problems that face personnel managers today in the light of developments that are expected to take place tomorrow.

The following summary of some of these problems is intended only as offering guideposts to those problems.

1 Problem of Acquiring Manpower

Selection of employees who have the potential to master the higher skills required in the use of new and complex machines, appliances, and equipment is the first problem.

The best techniques of selection including utilization of planned and directed interviews, careful review of the applicant's past experience, training, and character and the use of carefully selected tests to ascertain definite characteristics are essential.

2 Problem of Orienting New Employees

It is highly important that the morale and attitude of the work force of an industry so vital to community and national existence be not injured or diluted through the injection of individuals who do not understand the responsibilities they assumed in accepting employment with an electric utility. The first days of this employment will be an opportunity to inculcate in the new employee an appreciation of the responsibility he has undertaken and a knowledge of the problems that he must help to solve on a day-to-day basis and especially under emergency conditions.

3 Problem of Training

The training of individuals to perform their work in an efficient and safe manner will always be vital to the success of any enterprise. In the electric industry training must go far beyond the knowledge of how to do the job.

A development of a concept of service, of the vital necessity of sacrifice under adverse conditions, of maintaining good relationships with customers and the public are things that must be paramount in training people.

No training program under conditions which exist today, and will without question exist tomorrow, would be complete unless it contained means of bringing to the individual employee knowledge of the American system of competitive enterprise—what the system has accomplished and what must be done to maintain that system.

4 Problem of Management Potential

The industry's greatest asset is the people who make up its work force. Among these people are the men who will be supervisors and managers of tomorrow. The discovery of those who have potential for administering and directing the organization's affairs is essential if tomorrow's problems are to be solved.

The development of these people, as well as training of present supervisors and managers, to prepare them better for tomorrow's leadership is vital to company growth and efficient operation in the rapid growth of coming years. The old hit and miss technique of picking men who look like managers and placing them in responsible managerial positions with no preparation is outmoded and a relic of the old days.

5 Problem of Good Earnings

In periods of rapid growth it is always axiomatic that only nominal attention is given to improved methods and higher efficiency and reduced waste. Here is an area where the solution of the problem is difficult, but the challenge is great.

Management and work force alike must be constantly reminded that the good things of life—better wages, security, and other benefits—can come only from a successful profit producing operation. Personnel administrators should take the lead in bringing to the work force the need of work simplification, improved production, reduction of waste, and good earnings.

The problem of cost control through employee motivation is a growing one in this day of keen competition and rapid expansion. Planning and direction of programs to accomplish these results are one of the musts today and in the years ahead.

6 Problem of the Divided House

A new era into which we are entering requires a solid unified organization, every member of which is cognizant of its problems, its needs, and its objectives.

During the last two decades when the rapid growth of unions has been a significant phenomenon, there has been some tendency for an unfortunate spirit of antagonism between "the union" and "the company" to develop. Some of this antagonism is the direct result of political action to divide the American people into classes or cliques.

"The union" composed of company employees and "the company" composed of the same employees have failed to recognize that they have the same basic objectives; ie, the operation of a successful business organization to the end that they, the employees, may secure maximum benefits in cash wages, wage supplements, and job security. It is the function of personnel administrators to inform employees in the fundamentals of business economics so that they may know that:

- A company must furnish a service or make a product that is marketable at a price people will be willing to pay.
- To produce that service or product, a company requires money, ie, capital, in order that it may build and expand its physical facilities.
- The sale of products and service must provide enough revenue to compensate workers and investors adequately because failing to do so will deprive the company of one of its two essentials, either efficient labor or needed capital.
- Costs must be controlled in order to produce the product at a price level that can meet competition.

In the coming years, it is essential that employees, whether they be in a union or otherwise as well as management and the owners of the business, recognize the fact that a successful operation requires a cooperative understanding of the mutual objectives of labor and capital and a further understanding that these objectives are fully compatible each with the other.

7 Problem of Communications

The solution of virtually all other human problems in the industry today and tomorrow hinges on the effectiveness of communications. In every area of management, communications are the only means of transmitting thoughts, emanating policies, giving orders, bargaining, training, indoctrination, and influencing the thinking of people.

The responsibility for the development of effective formal and informal communication techniques rests squarely on the shoulders of personnel people.

The decisions as to the scope and objectives of the communication program which affects employees must be made by these people in cooperation with top management. They are primarily responsible for personnel policies, employee attitudes, long range objectives, and labor relationships.

Whether communications are between management and worker; between the same or varying levels of supervision, day to day between supervisors and men, or from employees to management, the development of the best techniques and types of communicating are the continuing responsibility of industrial relations managers.

In this area much needs to be done. The need for dynamic and effective communications is an important one and much of the future success of the company will rest on how well that need is met.

8 Problem of Proper Compensation

Wage and salary determination and administration is perhaps the field in industrial relations most beset with hazards. A psychological reaction of workers which is related in the Biblical parable of men hired to work in the vineyard still develops in today's economy when any individual feels that he is not compensated properly as compared with others. Attitudes resulting from the negative reaction in such a situation tend to lower production and sap morale.

The setting of a proper rate for each individual whether he be laborer or manager for the service which he renders is a basic fundamental of the American free enterprise system. The continuance of this system into the future is dependent to a marked degree on how equitably this determination is made—how well it is understood by those who want to be compensated fairly for their service.

This is no insignificant task, and its solution for today and tomorrow rests with personnel administrators.

9 Problem of Manpower

The advent of the age of automation coupled with spectacular growth are both related to the problem of manpower. The planning of manpower requirements for today and tomorrow and the utilization of such manpower for the highest degree of productive efficiency are in an area that has not been fully explored. These controls of manpower which are becoming more and more necessary pose a triple problem as they affect the individual worker, the company, and in many cases relationships with labor organizations under existing contracts.

It is of the utmost importance that careful analytical study be directed to this area of operations before the dawn of tomorrow.

These are some of the pressing problems that loom on the horizon, viewed from the vantage point of industry's operations, and these are the problems that the electric industry faces looking toward tomorrow. It is these problems and their solutions which rest squarely on the shoulders of the industrial relations department.

To the end that top management and personnel people recognize the magnitude and significance of these problems and seek the means and solutions, this industrial relations issue of Electrical World is dedicated. In undertaking this project and making its pages available for this purpose, Electrical World is rendering an invaluable service to the industry.

Preparing the Employee

H. L. BOWEN manager, Industrial Relations Department, Georgia Power Co, Atlanta, Ga.

Tomorrow's industry will have little use for the unskilled or untrained worker. If we can judge the future by the great technological changes which have taken place during the last decade, the employee in years ahead will be a man of education and a high degree of training.

Modern management is giving much attention to adapting and utilizing the many new technological developments and discoveries. In our own industry special attention is being devoted to the modernization and expansion of generating, transmission, and distribution facilities to keep pace with ever-increasing loads and to combat rising costs.

Our industry long ago recognized that it could not wait until loads had increased to the limits of existing capacities before constructing generating plants and transmission and distribution facilities. Hence, we have formed the habit of planning three, four, or five years ahead, estimating future loads and setting up construction schedules to assure always a margin of reserve capacity. In the same way we must plan ahead to be sure our employees will be competent to operate the vastly enlarged and more complicated apparatus which growth and scientific innovation are introducing.

In an age as dynamic as the one in which we are living, it is no longer sufficient for an employee to be trained for the tasks of the present. He must also be trained to adjust to and take full advantage of the new techniques and procedures which will confront him tomorrow and which are likely to alter his activities.

Trained Technicians Will Be Needed

In the years ahead increasing use will be made of machines in all of our operations. Therefore, trained technicians will be needed as never before. In fact, it may be said that our future productivity will be limited not by the number of machines we can manufacture but by the number and quality of the technicians available to operate the machines. We are going to need all the talent and ability we can get. Unless we start now to train our employees in the new processes and procedures, we simply cannot hope to achieve the maximum utilization of the human capabilities, our greatest potential asset.

There is no sign of a lessening of pressure for periodic wage increases. The only way these can continue, without risking our free enterprise economy, is through increased productivity. This, in turn, means the acceptance of a greater degree of automation.

Undoubtedly, automation will create problems. Workers will be fearful that greater productivity per employee will result in growing unemployment. But the fear that automation will eliminate jobs is unfounded. Instead, it will upgrade jobs by creating the need for an unprecedented supply of highly skilled men. It is up to us to make our employees see this—to point out to them that greater productivity means higher wage scales and a higher standard of living. The time to start this educational effort is NOW! Many of the technical changes which automation and atomic energy will bring about are already apparent, and it is not too difficult to predict the manpower problems which lie ahead. The trouble is that the pressures of the urgent problems of the moment have overpowered our two major questions of this time of change. First, where will we get the employees with necessary aptitudes and skills? Secondly, what can we do to prepare present employees for maximum adaptability and usefulness?

The revolutionary mechanical processes which are now being developed are aimed at greater production with less manpower and at lower cost per unit. If we make proper use of these processes, we will not only elevate the status of the workers of this nation; but we will be able to supply goods and services needed to improve the welfare and brighten the future of all mankind. But machines cannot think or dream or plan. They cannot sense the unspoken aspirations of human beings. And machines and mechanical processes—without inspired managers and competent operators—can create a chaos in which mankind becomes the slave rather than the master.

Our immediate problem, therefore, is selecting from our present workforce those employees who possess the educational background and desire for further training and development to fit into the requirements of tomorrow's higher productivity. This can be done to a large extent by job rotation and other on-the-job instruction, together with specialized and supplementary training given by vocational, college evening, and correspondence schools. Some employees so obviously possess ambition, initiative, and imagination that they can be selected for such training without much chance of error. Many others, however, will take careful screening, testing, and counseling so that our educational and training efforts will not be wasted or misdirected.

After we have selected the employees suitable for further training, there will remain those who are incapable of developing any greater skills. In terms of human relations this group will present the most difficult problems of all, for in it will be the workers whom automation will directly affect. Such an employee will experience a rude shock, when he realizes that his job can be performed just as well by a mechanical device.

As a transitional step we will have to undertake to find useful ways in which to employ the limited skills of this group in such manner as to disturb their earnings as little as possible. Here is a point where industrial vision and statesmanship will be hard pressed, and we cannot wait until the situation has developed before we begin to plan to meet it.

We must not overlook the fact that office workers as well as production personnel will be affected. The increase in the number and versatility of office machines is already creating a demand for more highly skilled operators. This demand will continue to grow. As a result these jobs will prove more attractive to male workers.

The potential scientists and technicians who will de-

velop automation and the application of nuclear energy to industrial uses are now in school. If they are to be induced to follow a scientific career to help alleviate the acute shortage, they must be influenced soon after their entrance into high school.

It is becoming increasingly necessary that we make an active presentation to these high school students pointing out to them the advantages of a scientific education. To pursue the necessary courses of study, in most cases, they must start with their first year in high school. With such a presentation we will not only interest a larger number in pursuing engineering courses after they leave high school but will be able to interest the boys who cannot attend college in entering our business and becoming skilled technicians through training on the job.

All of us are fully aware of the work we must continue to do at the college level, both with the students and faculty, to interest engineering graduates in entering the utility field rather than some other industry. We lose many of the most promising young men because they think the utility industry offers little opportunity for creative imagination, that its best years of growth and development are behind. That misconception is our own fault. The rapid growth of our business, the application of nuclear energy for the production of electric power, and other technological changes represent opportunities which fairly stagger the imagination.

These highly skilled employees, our future organizations, will have a greater going concern value than they do at present. A new concept may arise under which we will treat labor as a capital investment with wages considered as a fixed charge. This concept will make it necessary that we reevaluate our selection and testing procedures to be sure we will be getting better qualified people and that they are properly placed so as to get the maximum use of their potential abilities.

In order to keep these employees, it will be necessary that we have more than just a job which is competitive from the standpoint of pay. We must also satisfy their non-economic motivations. Many of them want both independence and security, not realizing the two are often in conflict.

"Security" is the poison that, if not checked, will eventually paralyze the American free enterprise system. Modern management is pressured by the idea that it must protect its employees and their dependents against every hazard of life; and where management stops, government and the unions pick up.

The advance of technology will make demands upon our employees going beyond the increased technical skills which they will acquire. No doubt, the jobs of the future will require the full capacity of all employees rather than of the top management group alone.

Jobs must be made more interesting, and each employee must understand the relation of his job to the other jobs in the company. With this knowledge he will generally feel a greater concern for the company's success.

In the public utility business it is important not only that the employee be well informed but that the company has a well-designed public relations program actively at work. It is recognized by all public relations people that a successful public relations program begins with the employees of the company. It is fundamental to a good public relations program to have each employee realize that public relations is a part of his job.

We must improve our techniques of communication. We sometimes take the easy way and try to make ourselves believe we are doing a thorough job with such devices as employee magazines, reading racks, canned programs, pamphlets, published speeches, and other printed matter—and wonder why these media don't achieve results. This approach will not accomplish the basic objectives of real communications which must move freely in both directions.

Employees can be motivated by being shown how they can benefit and also how they can contribute. We all know these principles of communication, at least in theory. In practice, however, we generally spend more time in telling and exhorting than we do in listening and finding out what employees really want to know.

We believe if all of our employees are informed about the company, its policies, and future plans, it will be easier to convince them that the aims of management and labor are not antagonistic but that on the contrary, both are trying to achieve the same result. Many disagreements at the bargaining table are caused by the ignorance of employees. They have no knowledge of the company's earnings and general financial status. They have no conception of the company's ability to sell its product in a competitive market.

Our training should be directed toward cultivating favorable attitudes as well as improved methods. The supervisor who is instructed to apply scientific human relations should be thoroughly convinced that the techniques are workable and effective. Many training programs exhibit a lack of sincerity which comes about from the fact that the supervisor is merely playing a role because he does not genuinely believe in the techniques he is using.

Hiring the Employee

C. C. WAGGET, Personnel Director, Community Public Service Co, Fort Worth, Tex.

In the recruiting and hiring of today's employees for the job of tomorrow there are many factors and problems involved. It would appear that three of these deserve special consideration.

First, the available supply of young men and women who may be groomed for the special skills required is extremely small, and the situation continues to deteriorate. Perhaps nothing better illustrates the magnitude and the seriousness of the situation than a recent item in "The New York Times" which noted that the volume of help-wanted advertisements carried in 98 major labor-market newspapers was 40% larger in 1956 than in 1955.

Second, during the past years the industry has experienced fantastic growth. With this growth has come the use of more intricate and complicated machines and equipment. The substation operator is being replaced with automatic devices and relays. The generating plants increase in magnitude and complexity and practically run themselves. Instead of the skilled operator or journeyman of today, we are going to have to develop highly skilled and intelligent technicians to handle the operation and maintenance of these machines and equipment.

Third, the shortage of engineers is no longer merely just acute. This condition has now become chronically acute. The need for these trained technicians will not be met by hiring the graduates of our engineering schools because they are not available. How, then, are we to bridge the gap between skilled classifications and the engineer?

In the light of present conditions it would appear that the companies should re-evaluate their selection techniques with a view of enlisting better qualified people. We need to examine carefully the applicant's scholastic record and see that he has the necessary credits in mathematics, sciences, and subjects necessary to qualify him for tomorrow's job. Aptitude tests are needed to see that proper placement is made. An intelligence test should determine whether he has the mental capacity to advance through the ranks and to broaden his stature.

We should make our industry more attractive for the prospective worker. Instead of hiring for a job, a plan should be developed that would outline the opportunities ahead. Perhaps our program of training should be re-examined to assure the applicant that there is a sound program of training to help him progress. The wage schedule is important, but the serious-minded prospect will first look at the opportunities for advancement.

To recruit future employees, companies should develop educational programs for those who want to continue schooling while they work. Three companies in Texas have a cooperative plan with a junior college in which employees work for 90 days and attend school for 90 days. One company has a plan that the employees will work for six months and attend school for six months. Perhaps the companies should offer to pay educational expenses for those who want to continue schooling while they work. While this will work hardship in scheduling work, it will aid personnel broaden their skill and qualifications.

Placing Employee in Right Job

JAS. E. KANE, Jr, Assistant Manager Personnel Department, Baltimore Gas & Electric Co, Baltimore, Md.

Success of any business is dependent upon the abilities and performances of its employees. In today's highly competitive labor market, it is imperative to make the right selection when placing new employees in order to reduce the cost of training and eliminate, as far as possible, personnel turnover.

It is the responsibility of the personnel department and the departmental supervisor to fill every vacancy with the best qualified person available. In order to fulfill its obligations of screening and making preliminary selection of applicants, the personnel department must be informed of the job to be filled, the duties and responsibilities to be performed, and the qualifications desired. The better the understanding of the job and its requirements, the more effective will be the results.

One tool which has proven very helpful to assist the interviewer in his selection is that of testing. Although many standard tests are available, a testing program should be formulated only after careful study. Experience has proved that errors in selection can be minimized by proper use of tests. Under no conditions, however, should they be used as the only criteria for selection. They should always be supplemented by a personal interview during which the interviewer can appraise the applicant's interests, ambitions, temperament, and general adaptability for the vacancy. The preliminary selection should be made after a thorough analysis of the applicant's education, experience (with details as to type of work and reasons for leaving each job), home conditions, interests, ambitions, etc, plus the supplementary data obtained from the personal interview.

Those selected should be submitted to the prospective supervisor, along with the application, and any other pertinent data obtained in the preliminary interview. The applicant should be informed of the duties and responsibilities of the job, shown the conditions under which he will work, and given a brief outline of the opportunities for advancement.

After the proper selection has been made, there is

also the problem of having the applicant accept the position. The majority of applicants have many job opportunities, and they shop around to obtain the best job available. Therefore, those responsible for selection have to do a real selling job. Applicants must be courteously received and interviewed under conditions which are representative of the organization. The more important sections of the company's benefit program and personnel policies should be discussed. The applicant's decision as to whether he will accept the job is based upon this information and his impressions of the company obtained from the surroundings and contacts.

As a final check on the selection, an investigation of business and personal references is desirable.

Training the Employee

C. J. HARTWIG, Administrator, Employment and Training, Northern States Power Co, Minneapolis, Minn.

Everyone in the industrial training field has felt the pressure placed upon him during the past decade for faster and bigger training programs.

Business expansion, technological development, increased business sensitivity to public opinion, and a slim supply of technically trained people have pyramided demands for accelerated training programs. As a result, many programs have become incomplete or superfluous in content. Lack of time to analyze properly training needs for new business practices and lack of instructional training for supervisory personnel have, in many instances, outmoded training programs previously considered adequate. Automation will not ease training personnel's burdens, but will place newer and bigger demands upon them.

Three objectives present themselves in the reevaluation and rebuilding of training programs:

1. **Produce a Sound Training Policy**

It is evident that to try to build a sound training structure upon a weakened foundation would only tend to complicate the problem; so practices should be revised.

There appears to be no better way to approach this problem than to make a complete analysis of each job or job specification (the written description of the operations, responsibilities, and duties of an individual's job). Training requirements, subject matter, training objectives for each job, and employee abilities to learn must be determined beforehand. From such an analysis can be ascertained not only the effect of present training programs but also the adequacy of training needs and objectives.

2. **Train Competent Supervisory-Instructors**

Even should the "perfect" training program be formulated, it will fall upon itself unless well-qualified supervisory-instructor personnel have been developed. Too many industries neglect this most important phase. Industrial training is so essentially a supervisory function that no employee should be placed in a supervisory position without first having had pre-supervisory training in teaching techniques.

An analysis of supervisory training programs—also with supervisory help—may reveal need for revision. Supervisory training requirements are changing rapidly with changes in business policies and practices. The need for development of human relations programs parallels the need for training in new technological operations.

3. **Obtain Full Management Cooperation**

A sound training program and a qualified supervisory-instructor staff will not by themselves produce an effective training policy unless there is complete unity of effort between all levels of management and the personnel staff. Each should be in complete accord with the subject matter of the training program, the training methods, and with the personnel in the supervisory training staff before the program is started.

Upgrading of the Employee

W. HUBER JOINER, Assistant Manager, Industrial Relations, Georgia Power Co, Atlanta, Ga.

One of the most important influences in the course of world history in the next quarter-century will be the quality of American business and technical leadership. Our problem today is not the development of men to deal with today's problems. We have those men. Our problem is to develop the men who will be able to deal successfully with the problems of 5 to 25 years hence.

The limiting factor with respect to volume and profits no longer is considered to depend primarily upon machinery and materials; rather it is a matter of having the right men at the right time to run our business succesfully. The goal, in any organization, is the effective utilization of all its human resources. We must make it possible for every individual, from helper or file clerk to president, to develop to the fullest extent his own potentialities.

We must begin early to guide people, making sure that those who don't offer real potentialities for development are eliminated before they become bottlenecks and obstacles to the development of everyone below them. While we are fulfilling our responsibilities to all the members of our organization, we should at the same time be giving special opportunities for development to those few individuals who will ultimately be our outstanding leaders.

We must have more faith in the day-to-day operations as a significant training ground for manpower. Formal courses and advanced training programs can be a great help only if day-to-day experience supports them.

In order for industry to meet the requirements for trained technicians and supervisors made necessary by technological developments, advanced training is essential. Through a sound policy of personnel testing, observation, and selection, the employees that have demonstrated real potentialities should be singled out and given well-planned advanced training. This advanced training should be followed up through systematic upgrading and job rotation so that the formal training program may be supported by day-to-day experience. In order for this whole program to succeed there must be an effective policy of delegation or decentralization within the organization, which is essential to the development of manpower.

Upgrading through testing and advanced training can create a dangerously demoralizing attitude among employees unless the organization has a well-defined program and a fair and consistent policy—one that is understood and wholeheartedly supported by all echelons of employees.

Reducing Labor Turnover

J. E. SHERIDAN, Personnel Director, Tampa Electric Co, Tampa, Fla.

Personnel people in industry are generally agreed that one of the chief causes of labor turnover is the placement of employees in jobs for which they are not suited. The employee who does not measure up to the requirements of the job, as well as the person who is overqualified, is not likely to be a long-term employee.

Recognizing this problem as a significant source of turnover, Tampa Electric Co has supplemented its regular employment procedures with a psychological testing program. A consulting firm was called in to assist in the development of the testing program for the selection and placement of job applicants. As a part of the personnel research necessary to establish such a program, an experimental test battery was administered to 300 employees representing all major job categories. These test results were statistically analyzed in two ways, as follows:

1. The characteristic test pattern in terms of abilities, interests, and personality was established for each job category. For example, it was found that linemen differed from power plant personnel in many important respects. While this is a matter of general knowledge, the test tryout identified those differences and demonstrated that they could be measured by psychological tests. Consequently, it was possible to establish differential job placement standards that are helpful in determining at the time of employment the type of job for which the applicant is best suited.

2. The second type of analysis made of the experimental test results was for the purpose of determining which tests were the best predictors of job success. For each major job group, the test results were compared with supervisors' ratings of the individual's job performance. It was found that certain tests were capable of discriminating between the most successful and least successful employees. Therefore, it was possible to develop test standards for identifying those applicants who are most likely to be the best performers.

The results of this research has led to a practical testing program that has demonstrated its effectiveness in the selection and placement of job applicants who have the characteristics that are possessed by our best present employees. Used in conjunction with the interview, application blank, and checks with references, the testing program has added objective and factual information on which to base employment decisions.

Programming for Automation

JOHN M. McCONNELL, Employment Manager, Rochester Gas & Electric Co, Rochester, N. Y.

We all recognize that automation is here. It has been with us under the name of industrial improvement for a number of years. We have felt the impact and accentuation of this process primarily because of scarcity of engineers and technicians.

When we analyze our industry needs from the manpower angle, we find our methods and operations are continually requiring a higher type of employee to meet the technological improvements in our industry. There is a trend to hire a more skilled individual than heretofore to meet these requirements. With the rising standards of employee requirements, there is a strong competition with other industries particularly in areas having a high ratio of skilled, technical, and professional personnel.

If this be the trend, we have a challenge not only to meet our normal present and immediate requirements but also to prepare for the future advances in the technological process in our industry. It is evident voluntary job seekers no longer suffice.

In order to obtain and maintain the high standard of employees, it is now necessary, first of all, to maintain liaison with the source of manpower supply and to conduct rigorous and sustained recruitment at the source. A

dynamic recruitment policy of this type should start and continue yearly at the level of the high schools, at least six months prior to graduation. The necessity of this recruitment is due to the fact that 95% of the high school graduating class are usually placed in industry and are at work as quickly as one month after graduation.

A progressive recruitment policy should be continued with technical trade schools and the colleges not only to stimulate interest and employment in our industry but also to attract undergraduates by offering cooperative employment (working on an alternate three months basis in our engineering areas) and summer employment.

Educational institutes have recognized the increased need of industry in these fields and are cooperating to the limit of their facilities and looking to industry for leadership and assistance. Recently one of our local cooperating technical institutes revamped and extended its curriculum to qualify graduates for a BS degree.

Too often we bypass the potential of our own work force. The public utility industry has been recognized as an industry which has a low turnover rate of employment. This fact can be to our advantage if we use our manpower for the continual development of our work force skills by further education, apprenticeship programs, recognition of ability and potential, and the education of our supervisors for greater utilization.

We should be continually alert to hire individuals with a potential for development and flexibility and to maintain procedures to assure the utilization of these skills throughout the career of each individual.

By the continual review and maintenance of up-to-date personnel record information on all employees we will be in a position to encourage and assist in their further education and development. This will stimulate promotion into better jobs where merit and increase of qualifications warrant.

Preparing the Supervisor

S. L. LEAHY, Manager of Employee Relations, Detroit Edison Co, Detroit, Mich.

Let me start by saying that our main job in preparing the supervisor for tomorrow's problems seems to be to help him to do better what is already expected of him. His responsibilities have increased, and he has a full management job to do. The change in this direction has been especially marked in the last 15 years. It is time for us to review what has happened in order to decide the next steps to strengthen his position.

These five points will outline the subject for brief consideration and give a basis for further discussion:

1. The nature of the supervisor's job.
2. It's importance in company operations.
3. The supervisor's feelings about his work.
4. Some ways he may be helped.
5. How the help may be given.

The supervisor today is called on to perform many duties. He takes part in selecting, inducting, and training new men. He assigns work and inspects it, reviews his people's performance and helps them improve. He counsels, disciplines, answers questions, gives recognition, handles grievances. At all times he gives his group the kind of leadership which results in full production and high morale, and he is a rallying point in time of crisis.

He communicates effectively with them and with his own supervisor, makes reports, leads meetings. He organizes his own time and work, looks for better methods, checks on costs and maintenance, observes safety practices, and he keeps himself abreast of his job and technically informed. This is not a complete list but one which gives an idea of the kind and variety of his responsibilities.

This is a big order and demands an individual able to handle many kinds of management problems. The supervisor recognizes the complexity and difficulty of this job but usually welcomes the challenge of leadership right on the operating front. In most cases, he wants all the help he can get and is looking for more information and more skills to do the job better.

Right from the start he has the problem of making the transition from operator or worker to overseer or manager. This is a different kind of job, one in which success is measured not by skill in doing the work but by ability to get the work done by others.

The quality of the management job is gauged by new standards, and the supervisor wants some guidance to recognize these and to plan his work accordingly. He has unfamiliar responsibilities and a degree of authority which he needs to interpret for each new problem that comes up. Equipment breaks down, a safety rule is violated, another department fails to do its part. On all these he faces the question: Do I take action, do I tell the boss what action I plan to take, or do I turn it over to him with a recommendation? On many problems the answers to these questions are not easy to decide.

Research studies make it clear that the supervisor is the key man in solving many management problems. One recent investigation showed that absence rates tend to be lower where the first-line supervisor has some authority in administering the absence procedures. He can make some decisions on granting pay for time off or decide action on chronic cases.

Another study brought out a similar picture on costs. One hundred percent of the foremen who said they had even "a little say" in spending money budgeted to them also said that keeping track of costs was part of their responsibility. But only 27% who said they had "no say" felt responsible for costs. The supervisor showed concern for costs when a part of the responsibility for costs was delegated to him and when he was brought in on decisions about expenditures.

A morale analysis produced conclusions which might have been expected—that the supervisor was the key morale factor. There were other influences at work, but the kind of example and leadership he offered had more influence on the group than pay, policies, and working conditions. One explanation offered by the research team was that the supervisor held largely in his hands the important non-financial incentives and satisfactions that people look for on their jobs.

Does the supervisor generally feel that the importance and difficulty of his work have been recognized? In talking to him, he often mentions his need for more latitude on decision making and better support on stands he has

taken with his group. He asks for better information on management planning. Often he remarks about his lack of time to do an adequate supervisory job and his need for better preparation to handle problems of personnel and policy interpretation. A survey of 16,000 foremen made last year by Temple University gives us this information:

44% of foremen said they are not consulted on policies.
45% said they are not backed up on decisions.
35% feel they are not part of management.
35% feel communications are poor.
76% don't know how they're doing.
58% feel they need more authority to settle grievances.
60% feel training in human relations is inadequate.

The people under them have similar feelings about their supervisor's position. In a survey two years ago 54% of the employees in one power plant said their foremen did not have enough authority to decide the things they should decide, and 41% of the employees in a clerical department felt the same way.

In considering the preparation of the supervisor for tomorrow's problems, we might ask ourselves some questions like these:

- Can we do a better job of supervisor selection with emphasis on the ability and inclination of the individual to work through other people?
- Can we do more toward giving supervisors a larger part in solving management problems and making decisions?
- Can we help the supervisor draw up a clearer definition of his job, as distinct from those above and below, to the end that he can measure the effectiveness of his performance?
- Along with this can we put emphasis on the way he does his job as well as on the results he gets?
- Can we give him better guidance on planning and organizing his work and scheduling his time?
- Can we improve the skill of the man to whom he reports in coaching and developing him, and in giving him a climate in which he can do his best work?
- Can we set up patterns of communication that will enable him to act with greater confidence and understanding?
- Can we give him better opportunity to grow in his technical field—to keep abreast of research and new developments that affect him in his work?

3 Ways to Help the Supervisor

These are broad questions and won't be answered by any single approach to the problem of supervisor development. We want to help him get the attitudes, skills, and knowledges he needs to do his job effectively. There are three general patterns we can follow:

First, the emphasis can probably best be kept on the individual development of each supervisor in his own situation. The responsibility for doing this rests with the man to whom he reports. It calls for continuing coaching and counselling—planning with the supervisor, delegating to him, directing through him. Regular appraisals of his performance can also be a part of this.

A second approach to strengthening the supervisor is to work with the management team of which he is a part. These teams are organizational units such as a department head and the supervisors who report to him. As they plan together and work on common problems, the supervisor gets the feel of the team's thinking and shapes his own practices accordingly. This is a natural kind of development and recognizes the supervisor's dual role as a subordinate in one group and a leader in another.

General Education Would Be Helpful

General education is a third approach in which groups of supervisors with common needs can be brought together for training and exchange of ideas. Management training within the company, university courses, and consultation with specialists are in this category. The general education of the supervisor is important but calls for follow-up activities to assist on application of principles to the job itself.

Many companies, manufacturers, and industry associations already are active in the sponsorship of courses for management. However most are intended only for the higher echelons. There is need for similarly well-conducted programs for other supervisors. Such programs could be handled by individual companies and no doubt would pay off in better productivity and morale.

Certainly we can agree that the supervisor's responsibilities have increased because of the management job he must perform. Any efforts to develop him and strengthen his position will be an important step toward meeting tomorrow's problems.

Picking Capable Supervisors

DONALD A. BARTLETT, Director of Industrial Relations, Western Massachusetts Electric Co, Springfield, Mass.

Years ago, when management was faced with the selection of a supervisor, few companies had any definite selection program or tests to apply. Usually the selection was made on the basis of the employee's past performance rather than on consideration of his supervisory capabilities. While it is unfortunate that some companies have not changed their antiquated procedures many are now using definite programs for supervisory selection.

It is true that supervisors for certain specific assignments should possess particular qualifications which would not be required by others, but for all there are some general qualifications desired, for example, an interest in human relations. It is top management's responsibility, both to the company and to the employee, to weigh the prospective supervisor's qualifications very carefully before the appointment is made.

Many companies are now resorting to tests of one kind or another. Such practices provide helpful tools in aiding selection, but such tests are not valid when used alone.

It is usually possible to detect and spot some employees who appear to have potential for supervisory responsibilities at the moment they are hired. By keeping necessary records on these employees, it is possible to determine at a later date if the early observations were sound.

The initial employment interview will provide certain clues as to the potential of the applicant. Subsequent tests and performance will produce additional clues that are valuable. His work habits over a period of time will indicate many traits including ability to carry out orders, willingness to accept responsibility, and any other leadership characteristics.

Another point to be considered is his desire for advancement, not only financial, but his desire for increased responsibilities which is an inherent characteristic of a good supervisor. The final clue may be found through a series of patterned interviews with the prospective supervisor and his immediate supervisor.

After it is agreed that a prospective employee may have supervisory potential, he should be encouraged to prepare himself for supervisory responsibilities, either by some formal education program or through some informal courses sponsored by the company. These courses should include technical aspects of the job, company policy, and accepted principles and practices of supervision. As a result of this preliminary training, it is possible to eliminate those who do not respond as expected to training.

It must be emphasized that many people neither have supervisory traits nor the ability to develop them. It is therefore most important that great care be exercised in the selection of only those who appear to have the qualities for development into good supervisors.

Promote Which Employee?

ROBERT E. SCHWAB, Assistant Manager of Employee Relations, Detroit Edison Co, Detroit, Mich.

There is increasing evidence that a company's success is closely related to the kind of supervisors it has. High productivity, low cost, good service, adaptability to change, high morale—all these require effective leadership. The role and qualifications of the supervisor who can best develop teamwork and motivation are being clarified through research in human relations.

Traditionally, seniority or job skill and work performance were major factors in selection from the work group. Unfortunately, these criteria are not necessarily predictive of leadership potential. The traits which cause an employee to stand out as an individual worker may be liabilities to him as a supervisor. It is often said that we promote a good worker and make a poor supervisor. Both he and the company lose if a supervisor is selected who is not qualified for such work.

Among other qualifications the effective supervisor must have considerable "human relations" ability. He must be sensitive to the needs of others for recognition and growth. He must be skillful in working with both individuals and groups. He derives satisfaction from helping others develop. He seeks and uses their ideas about the work because he has sincere confidence in their ability and desire to do a good job, and because he believes in participation as a means of developing mutual interest and motivation.

Judging leadership qualifications is not easy. To help, two aids to selection are being used increasingly. One is the psychological test designed to measure sensitivity to human relationships. The other is judgments from members of the work group as to who would make the most effective leader. Neither of these should be the determining factor in selection. They are additional facts to be carefully weighed.

In using human relations tests, the usual precautions must be carefully observed. No test is valid for selection unless it is shown to be related to success in the specific situation in which it is used. Once the extent of such relationship is established, test results can help improve selection.

Opinions of the work group are useful because employees are often sensitive to leadership traits of their co-workers. Naturally, if they are asked whom they consider best qualified, their confidence must be preserved and the information used only for the purpose for which it was solicited—to help in selection at a specific time for a specific job.

Responsibility Makes Bosses

M. O. WILSON, Personnel Director, Appalachian Electric Power Co, Roanoke, Va.

A supervisor should be given enough rope to do the job but not enough to hang himself. This "rope of responsibility" should be handed out as rapidly as the supervisor demonstrates his ability to handle more.

This ability to make logical and quick decisions on important matters is a basic quality in a supervisor. It's often the difference between your best supervisor and your weakest.

How does a supervisor develop this talent? He develops it through practice. No star performer ever got top billing without first putting in hours of practice. Likewise our supervisors must be allowed opportunities to practice with this management tool.

If a supervisor is delegated the responsibility for getting a job done, he must be allowed to exercise some independence in carrying out the job. Sure, he will make some mistakes from time to time. But he should not be blamed for trying. Encourage him to profit by those mistakes.

Of course, it's a fundamental truth no two people are exactly alike. Some supervisors will have to be encouraged while others more aggressive will have to be held back.

The more reticent supervisors should be made to realize that the best fruit is generally out on the end of a limb, and he has to go out there if he hopes to get it. If he should fall, then you should cushion the shock and administer first aid. This can best be done by having him attain success quickly in some other aspect of his job.

If a supervisor has not developed, let your first question be: "Where have I fallen down?" Perhaps you haven't made sure he has the proper job knowledge. Was he informed about policy changes before his men knew about them? Does he know how you and top management feel about the subject? Is he adequately informed to represent you and the company to his men and to the public?

A word of caution: Don't expect miracles overnight. Some are born leaders while others have to be developed. Even the best of us aren't perfect. When a supervisor's abilities equal or exceed the needs of the job, then he should be a candidate for promotion.

If your supervisors have been properly selected, they can be developed. If a supervisor will not assume responsibility to make decisions and act on them, then it indicates faulty selection rather than faulty development.

Finally, if a supervisor has a thorough knowledge of the job and the ability to impart or use that knowledge, then he can afford to assume the responsibility. It's up to you to hand out that "rope of responsibility" to your supervisors so they can develop into the leaders your company needs.

Training Supervisors

R. E. PHENICIE, Personnel Assistant, Wisconsin Public Service Corp, Green Bay, Wis.

The tremendous growth potential of the utility business—the increasing high pressure competition for the customer's dollar—the complexity of management in society a decade hence—means stepping up the tempo to train tomorrow's supervisor today. Tomorrow is almost here. The need for the supervisor trained in cost reduction, human engineering, motivation, and leadership is around that next corner. Is there time to fill that hungry mind with all it needs to know?

The answer is "no" if you are planning to organize formal training programs and educate from the ground up. Wholesale education which falls on the receptive and unreceptive alike will never do the job in sufficient time. Development, to be effective, must be self-development. Individual growth is the streamlined way to meet the challenge of the future.

On the assumption that your company has enough of those enlightened employees who can be stimulated in self-development for the purpose of greater personal achievement, what is the next step? Many companies have already pointed the way. They have given these individuals, through personal guidance, work experience, and outside study, the opportunity to separate themselves from the masses.

In which areas of education can a man pull himself up by his own bootstraps? There are four fields in which a man can accomplish much through his own efforts.

Advances in technical knowledge can be obtained through study courses, outside reading, membership in technical and trade organizations, job rotation, or visits to other utilities. Personality development is usually aided by affiliation with organizations and civic projects and participation in activities requiring public speaking, written communication, and conference leading.

A basic understanding of economics and business management can be secured through organized study groups; completion of formal study courses; attendance at seminars; and reading of appropriate books, periodicals, and newspapers. Human relations can best be learned by actually working with people but much background can be cultivated by pyschological and philosophical readings.

The greatest gain that any company can receive from a non-structured program is that it indicates those supervisory candidates who realize the importance of investing in oneself.

Information Improves Bosses

C. E. JONES, Director of Personnel, Mississippi Power & Light Co, Jackson, Miss.

A well-informed supervisor is obviously a better-equipped supervisor to manage and direct the work of others and through being informed becomes better prepared for both today's and tomorrow's problems.

As the supervisor is the connecting link between top management and those whom he supervises, employees necessarily look to him for information about their company and their jobs. Let's see how information, or lack of it, affects the kind of job a supervisor does.

A well-informed supervisor has a feeling of both security and accomplishment. Through being informed himself, he is able to contribute toward achieving a better understanding of company objectives. As a result, employee morale is improved, and a closer relationship exists between the employee, the supervisor, and the company.

When events occur about which the supervisor has little or no information, an atmosphere of uncertainty is created in his mind. He feels insecure not knowing how he may be affected, and his concern is in turn reflected by his employees. Conversely, being well-informed not only gives the supervisor confidence but also builds up his prestige in the sight of his men. The more they feel he is "in on the know," the more they will respect him as a part of the management team.

Keeping the supervisor well-informed is the best insurance against the adverse and pyramiding effects of rumors. People draw conclusions from the information they have and in most instances will form the wrong conclusion from being improperly informed more quickly than they will arrive at the right conclusion based on facts.

A well-informed supervisor is a better representative of his company to the customers and to the public. A supervisor in any organization, regardless of his rank, is expected by customers and the public to know all the answers to questions concerning the business. This means not only in his own sphere but in the many spheres making up today's companies.

These factors make essential a well-planned and carefully organized information program for supervisors. Such a program may include newsletters, bulletins, conferences, policy manuals, employee publication, special meetings and letters, and where practicable, daily face-to-face contacts.

Mississippi Power & Light Co employs several media and programs for disseminating information to supervisors. The two primary sources of specific information consist of a "Supervisors' Bulletin," and monthly supervisory conferences.

The Supervisors' Bulletin attempts to bring to all supervisors in condensed and concise form pertinent information on important happenings and activities in the company. Although usually issued bi-weekly, special issues are released when needed.

Supervisory conferences, regularly scheduled for two hours each month, also provide a splendid medium for keeping supervisors properly informed. These conferences are held in all division headquarters and are quite often led by department or section heads from the general office.

Supervisors Are Management

JOHN J. FOLEY, Personnel Counsel, New England Power Service Co, Boston, Mass.

I remember once hearing someone say that to the employee in general, a company is only the long shadow of his own supervisor. Let's paraphrase that and say that the whole management team is only a long shadow of the first-line supervision.

We know that in these days of large corporate growth, complex organization, and increasing automation, top management and the rest of the management team has necessarily become increasingly sensitive to communications, to motivation, to the whole field of human relations.

There are fairly wondrous devices for two-way communication between top management and the employee group. But it is hard to visualize anything more effective than the two-way communication possible through the capable first-line supervisor, the one member of the team in the aggregate in close personal touch with each employee.

Motivation has been described as getting people to like doing what you want them to do. It is not a simple thing. Basically it is dependent upon the framework of company policies and practices established by top management. However, can anybody give us a real argument if we say that motivation, in a large sense, is the sum total of the feeling of personal confidence, personal respect, perhaps even personal loyalty of each employee for his supervisor?

In fact is it reaching too far to say that the establishment of good human relations in any organization stands or falls upon the skill of supervisors in dealing with human problems? I don't think so, and I believe most people in our field will agree.

In this early football season let's extend our analogy of a team to that sport. A capable coaching staff sets the pattern—players selected for particular ability, well equipped with fine plays, well trained in execution—but eventually comes the time when 11 men have to take the field and make it all pay off. These are our supervisors—especially selected, equipped with good basic policies, well trained—and they are the ones in the last analysis who have to make it pay off.

Preparing the Labor Organization

3 **E. J. THIMME**, Industrial Relations Manager, Electric Department, Public Service Electric & Gas Co, Newark, N. J.

The management function of planning for the future is at least as important in the field of industrial relations as it is in any other phase of business operations. Planning in this field is unique in that the cooperation and support of the labor organization are essential in preparing for tomorrow's problems. This, of course, refers to those companies whose employees are represented by a union. For this discussion the labor organization will be considered as the official body of the union—the officers and leaders—the policy-forming, decision-making group—not as the rank-and-file membership.

If we are to obtain this cooperation and support, we must be able to acquaint the labor organization with the nature of those problems. It is expected that population will increase from 165 million in 1955 to 204 million in 1970 and that there will be insistent demands for continually higher standards of living. In 1955 the Gross National Product was $387 billion. It is estimated that the GNP resulting from the additional population and higher living standards will be $550 billion in 1970, expressed in terms of current dollar value. Similarly, disposable personal income is expected to increase from $270 billion in 1955 to $413 billion in 1970. The prediction of an increase in electric energy consumption from 544 billion kwhr to over 1,400 billion kwhr is considered realistic.

Major increases in population are expected to be in the groups younger than 20 and older than 64, and the available labor force is normally considered to be drawn from the 20 to 64 age group. With an increase in the working population of less than 20% by 1970 GNP will increase by over 40%, and electric production by almost 160%. This means a substantially higher increase in per capita production.

The major problems with which we will then be concerned, and for which we must prepare the labor organizations, are those related to productivity and efficiency. As solution of these problems is the basic objective of an industrial relations program, there is nothing new in their nature. We have all witnessed attempts to limit the amount of work performed by an individual:

- To make the "honest day's work" something less than honest.
- To loosen quality as well as quantity standards.
- To overemphasize seniority in promotions and transfers to the point where the efficiency of the work force is adverely affected.
- To limit flexibility by jurisdictional restrictions.

We can expect increased pressures along these lines. At the bargaining table we are sure to be confronted with demands for a shorter workweek, additional holidays, and more liberal vacations. Together these factors will present a serious obstacle to increased efficiency and greater production.

Most of the problems we have mentioned so far are the result of pressures based on strong trade union principles.

The fundamental objectives of labor organizations are, however, higher wages, better working conditions, a continually improved standard of living. Our basic problem, then, is to show the labor organizations how we can help them achieve those objectives. We must work together to show them that work limitations, inflexibility, and attempts to infringe on management functions and responsibilities will endanger their very reasons for existence.

Experienced labor leadership has gained considerable maturity, just as we have had to gain it. Labor leaders have learned that constant bickering and petty annoyances do not pay off; that management and union have common objectives; that mutual understanding and cooperation can be achieved; that all these things make for a happier and more abundant way of life; and that production, profits, and the well-being of the union and its members go hand in hand.

The first step—and many others—in preparing the labor

unions for tomorrow's problems must be taken within the management group. It is the formulation of a specific and forthright philosophy toward labor-management relationships. This must embrace sincere and unquestioned recognition of the union as the bargaining representative of our employees; the willingness to pay fair wages and to provide good working conditions; the desire for harmonious relationships, up, down, and across the entire organization; the objective of having the company considered a good place to work.

Let's be sure that we understand the industrial relations function. It is not a negative function—the technique of saying "no"—giving as little as we can, continually "fighting the union." It is a positive, creative, dynamic function dedicated to efficiency, production, and progress and achieved with the understanding and cooperation of the union.

Then explain your industrial relations philosophy to the union. Make it clear that you give it sincere and unqualified recognition as bargaining representative of your employees, not merely legal recognition but a continuous, day-to-day recognition based on respect for the union's functions and responsibilities. Make it just as clear that you expect equal sincerity and respect, the same recognition of management functions and responsibilities. Let the union know you intend to fulfill your responsibilities and that it must live up to its own responsibilities if it wants them to be recognized and respected. Define those responsibilities, both the company's and the union's.

Assure the union that you will not in any way attempt to weaken the allegiance of your employees to it. This is extremely important. Without a feeling of security the union will not be cooperative. In an "anti-union" atmosphere the attitude of an employee toward his work will be adversely affected.

Also let the union know that you intend to restore the basic employer-employee relationship and that you will not permit it to come between the company and its employees. Employees can be and, in general, want to be loyal to both company and union. Unfortunately, in many cases we have permitted the employer-employee relationship to break down, often through a sincere but ill-advised approach to improvement of the company-union relationship. Loyalty of employees to the company is essential to a productive and efficient tripartite relationship of company, employee, and union.

Be sure the union knows that you believe in fair wages, good working conditions, and in giving employees a fair share of the fruits of greater productivity. Be sure it also knows that you will resist any attempts to obtain more than a fair share.

Inform the union that there will be no arbitrary exercise of authority but that strict discipline will be maintained. A firm company position toward discipline is a relief and a help to the union. Vacillating or weak supervision creates headaches for both union and company.

This is all part of the preparation for tomorrow's problems—the building of a foundation of mutual confidence and respect completely essential to the attainment of production and efficiency. Now we're ready to talk frankly and straightforwardly about our production problems. Explain the relationship of anticipated production requirements to labor force growth, that an increase in individual productivity is essential, that a cooperative understanding must be reached in order to meet our production requirements.

As today's problems haven't been solved, they are also tomorrow's problems. Talk about tardiness, absenteeism, soldiering—abuse of the "coffee break" and "wash-up" time—late starts, early quits, and lengthened lunch hours. Don't talk about these things as complaints. Their existence is as much the fault of management as it is of the union. Let's talk about them as problems. Talk about featherbedding, slowdowns, and jurisdictional restrictions. Emphasize the fact that all of these things lower production standards, waste badly needed manpower, and work against higher standards of living.

It would be naive and unrealistic not to anticipate tremendous resistance to this program. This resistance, however, must and can be overcome. Solution of our production problems is supported by sound reason and logic. In solving these, use of reason and logic is not only helpful but essential to attainment of the union's objectives. Understanding of the problems must be obtained, however, together with equal understanding of the fundamental economic principles involved.

Union and Industry Problems

WILLIAM ISMAY, Personnel Manager, Arizona Public Service Co, Phoenix, Ariz.

For hundreds of years, men of vision, patience, and understanding have been attempting to bridge the canyon of fear and distrust that has existed between labor and management. Theirs has been a task of pioneering in human relations that has been a tremendous one indeed. Their progress has been slow, but constant improvement has been effected. Bitterness, avarice, and pride have blocked the way many times. Blood has flowed, lives have been lost, dishonesty has raised its ugly head. But through it all, men of stout heart and high motives have worked incessantly to restore and maintain order and progress.

What has been built must be strengthened, and the surest and quickest way to add strength to any organization composed of two or more sets of human elements which have inherent differences is to combine their efforts in the solution of common problems.

Those of us in the management segment of our industry must recognize that those problems which we call industry problems are not peculiar only to management. Of necessity, industry problems must be union problems. Customer problems become union problems. Morale problems become union problems. All are our problems whether we

or the union officials readily admit that they are.

So it then becomes management's responsibility to seek the active assistance of the unions toward a solution of its problems; and then the unions must recognize that just as they share in the successes, profits and progress of the industry, so must they share in the solution of problems which make it possible to achieve our goals.

The fact is sometimes forgotten by both union and management groups that they have declared themselves to be equals, both morally and legally, by affixing their names to a contract, which should be for them a CONSTITUTION of labor-management relationships. They are saying to each other that, "Only among equals can there exist a self respecting relationship of mutual confidence and co-operation."

Within the framework of this CONSTITUTION, the union will find ways not only to assist management in the accomplishment of any given number of work units but to build solid community and national relationships for the industry as well. Without the help of the unions, the industry's current and impending fights on government encroachment in business, tax equalization, preference clauses, and similar problems will be anemic efforts indeed. When the public sees that industry and the unions are united in their efforts, they will exert their weight where it will do the most good to effect solutions.

Union Planning for Tomorrow

E. R. EBERLE, Manager of Industrial Relations, Public Service Electric & Gas, Newark, N. J.

Management by its actions today can and does profoundly affect the union's plans for tomorrow. In this sense, management does in fact participate in preparing the union for tomorrow's problems. This preparation may be helpful to the union and useful to management if properly conceived and ably pursued.

What will be the general nature of tomorrow's industrial relations problems? One important factor which will have an impact upon our future industrial relations environment will be the economic picture.

In meeting the manifold labor relations problems that will accompany an expanding economy, management and union have basically an overriding common goal—a goal which might be quite simply defined as **prosperity.** In preparing the union for tomorrow's problems, it is fundamental that union leaders understand the stake that the union has in seeing management continue its operations at a profitable level. The union must further be brought to the clear understanding that only through a joint effort with management and through cooperation in reduction of waste of manpower and material can a **continuing** increase in the standard of living be maintained.

The relationship between a company and a union will in large measure depends upon the treatment accorded the union by the company and upon the union responsibility such treatment engenders. Fair treatment includes such ingredients as these: (a) unreserved recognition of the union by management; (b) forthright dealing in contract negotiation and in processing of grievances; (c) non-competition with the union for workers' loyalty; (d) keeping the union informed; (e) cooperative effort with the union on matters of common interest, such as, community chest, etc.

Against such a background, a feeling of mutual respect and understanding can prosper and grow between the company and the union.

Union as Aid to Management

W. F. CARHART, Wage Coordinator, Consolidated Edison Co of New York, Inc, New York

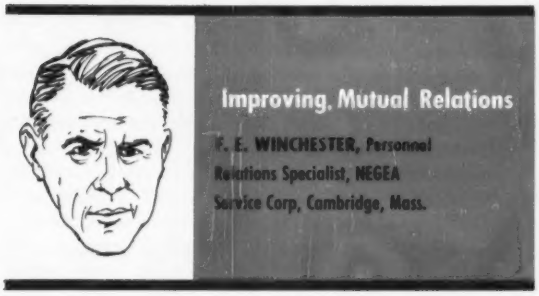
To attain common objectives, a union can cooperate with management in a number of areas of endeavor including:

1. Acting as an effective channel of communication to and from the employee body, particularly in fostering the various educational processes involved therein. This includes helping management in getting across to the employees the company's basic objectives and major plans and clearly presenting the mutual rights, responsibilities and obligations of the parties. This medium may also provide a reliable sounding board of the company's supervisory actions.
2. Cooperating in management's efforts and programs to improve the efficiency of operations, service programs, and policies by eliminating wasteful practices and reducing lost time, spoilage, poor performance, and accidents.
3. Being an effective voice in developing and maintaining good public and governmental relations.

Whether a union can fully cooperate with management in all of these areas, in view of the various pressures to which it is subject in its organizational relationships, depends of course on many elements. To furnish such cooperation, a union must be truly representative of the employees and have responsible and intelligent leadership. By the same token, to create the required harmonious atmosphere, management must first demonstrate its own leadership in promoting a common maturity.

The management that will best benefit from its union relationships is the one which, in its every day operations as well as during its major negotiating periods, gives full recognition to the problems of the union and through its actions and programs strives to develop a mutual trust, an integrity of relationships, and a realistic and intelligent approach to problems of employees, owners, and public.

None of this means that the union must abdicate any of its responsibilities to represent fairly and adequately its members. Nor does it imply that management need relinquish any of its basic rights to manage the business efficiently. But to obtain such union cooperation, management must recognize the union as a constructive force in achieving those objectives common to both.

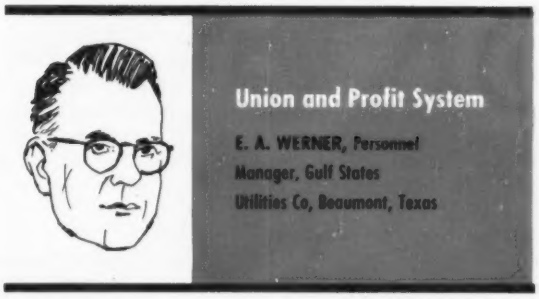


For some time now industry has hammered with increasing skill at the problem of creating "better mutual understanding" between management and its employees. The start of this process may well take place at the bargaining table. The negotiators for the company and the union should express themselves in clear, concise words that reflect the true meaning and intent of the parties. The company should then accept the responsibility of insuring that its supervisors and the union stewards also have a clear knowledge of the negotiated clauses by joint conferences to explain and interpret the clauses and provisions of the new contract.

There are several other ways to bring about "better mutual understanding:"

1. Permit and encourage broad discussions on all issues during negotiations and do not impose narrow restrictions.
2. Show an interest in union problems. Don't be quick to say, "no." Better to say, "we'll consider." After consideration has been given, then is the time to say "no"—if necessary.
3. Keep communication lines open and avoid unnecessary rumors and misunderstandings. Misconceptions one after another will disappear when the facts are forthrightly and adequately made available to all concerned.
4. The importance of selecting and training company supervisors must be stressed because "no business today can succeed faster than the quality of the foremen in the front line ranks make possible." It is in the hands of these men that management places the responsibility of administering its policies; directing its work force; and listening to the complaints, etc, of the workers.
5. Company policies should be clearly written by management and uniformly interpreted by its supervisors to avoid misunderstandings and possible friction arising because of contradictory action in several divisions or departments of the same company.

Industrial progress is still in its infancy. There is no doubt that American workers can expect their living standards to keep on rising over a long period. Only by securing better understanding of its reasons and motives can industry accomplish the goal of freedom of action to operate according to the dictates of sound business techniques and moral obligations.



The 66 million members of this nation's working force, organized or not, certainly want to improve their standards of living. And they are learning that to obtain more of the good things of life for themselves and their families they must be interested in helping the employer fulfill his foremost responsibility—that of operating his business at a profit.

The employees are beginning to realize that profit is not only an economic necessity but a system as old as our nation's precious freedoms, as old, in fact, as liberty itself. As the cornerstone of American free enterprise, the profit system has contributed greatly to the economic stature of the United States.

Today management and labor are striving for a common goal—prosperity. Management realizes that prosperous wage earners cause business to thrive. The wage earners realize that to gain more return for labor, they must produce more and help earn more profit for their employers.

Technological progress requires technically trained men with a mission in life. Perhaps ambition and pride are proper terms—ambition for a higher living standard and pride in production for profit.

That's where the industrial relations or personnel manager enters the picture. It is his responsibility to teach the employees the facts of business life, explain the profit system, and tell the employee how his efforts and ideas can stimulate production, which, in turn, creates money for materials, wages, and something left over called profit.

It behooves management to establish a program of personnel requirements and procurement for the next 25 or 30 years and maintain an up-to-date personnel inventory. New personnel should be indoctrinated with the numerous advantages of social and economic progress via the profit system.

Preparing the Industrial Relations Organization

4 F. L. LARKIN, Vice President, Wisconsin Electric Power Co, Milwaukee, Wisc.

It seems appropriate to begin with an observation that few industrial relation departments are properly equipped to cope adequately with today's problems, to say nothing of the more complex problems of the industrial tomorrow. Public utilities are companies in which the sciences have been applied to a high degree; that is, almost every place except the industrial relations department. Basic problems which will yield only to the right combination of engineering and the social sciences are still unsolved.

Man is not by nature fitted for a mass-production way of life. The change has come too rapidly. Although the worker of today did not himself live in the era in which the majority of workers were individual entrepreneurs, every part of him that makes him human did. He senses that something is wrong, something is missing which he cannot define. It adds up to an industrial problem which will become more serious tomorrow. The solution is a responsibility of the industrial relations department.

Only brief discussion can be devoted here to a few industrial relations functions which if adequately developed will aid the final solution of the over-all problem of morale.

Some Work Better Alone

Industrial relations people know that no two people are precisely alike. They should know that the primary cause of frustration, lack of job satisfaction, and just plain trouble is improper job placement—the misfit. Among those individuals who from the usual employment screening appear to be desirable applicants, some will work best as members of large groups, others in small groups, others alone. Some will be satisfied and proficent on routine work which will completely frustrate others. Some will excel under only general supervision; others will be most satisfied with close supervision. Can your employment procedures today sort the applicants into such categories?

Among the many interrelated manual jobs, each has different characteristics. Can your industrial relations department procedures pick from a group of relatively equal applicants the man who will do best as a lineman, a troubleman, an electrician, or a switchboard operator? Among engineering vacancies some involve primarily low level, almost routine work; others a substantial amount of development work; others almost entirely development work. If a number of engineering graduates applied, can your industrial relations procedures tell which will do best on routine work, which on pure research, etc. Don't be fooled by grades, or are you?

A great, almost terrifying responsibility of the industrial relations department in the future will be to select the right people for those transfers and promotions which lead to management work. It is also terrifying to see how ill-prepared industrial relations departments are to assume that responsibility.

By "management" is meant the entire supervisory force from top to bottom. When companies were small and operations simple, natural selection was good enough, the cream just naturally rose to the top. But in recent years size and specialization have so homogenized the working forces that the "cream" no longer becomes self-evident. It has to be "discovered," and projects extending over years have demonstrated that without new tools of discovery much top-notch supervisory talent remains buried—victims of size and specialization. There is no surplus of executive talent, and neither the public utility industry nor the nation can much longer afford the loss resulting from failure to seek out such talent. Nor can we afford inferior substitutes.

The seeking out of supervisory capacity is definitely a responsibility of the industrial relations department. I am unconcerned about the reaction of the operating departments to a statement that the selection of supervisory personnel cannot safely be left to such departments without the assistance of specialists.

Training is not the answer, experience is not the answer because the finest management development programs will never make first class management people out of inferior raw material. Although the thought is disconcerting, the top-notch management person either has or does not have the inherent ingredients for success. Although training and experience can help any person, they cannot create an inherent capacity which nature omitted or early environment failed to instill. The criteria normally used in the selection of people for supervisory positions cannot adequately predict an individual's capacity for such work.

It is possible to develop management selection procedures which, with a very acceptable degree of accuracy, will not only separate non-supervisory from supervisory potential but will predict the maximum level at which an individual can function competently. BUT—such procedures can neither be developed nor successfully administered by the present industrial relations staff. The skillful services of trained specialists in the field of industrial psychology are the ingredient which must be added.

Within the past 12 years many utilities have been parties to a deliberate "lousing-up" of wage rate differentials through a long series of across-the-board, cents per hour increases. The result: Wage rate comparisons exhibit little resemblance to the relative duties, responsibilities, and job conditions. The inequities created will not only be costly to correct but also the effect on the morale of the highly skilled employee will be destructive.

Here again is a situation wherein very science-minded companies have failed to inject engineering principles into the establishment of wage rates and ranges. This despite the fact that before some readers were born, the principles of analysis and synthesis had been successfully applied in the determination of job values. For the responsible industrial relations people to justify the cents-per-hour orgy by stating that the unions insisted upon it is not much more than an admission of an earlier failure to establish, jointly with unions, a sound system of job analysis and evaluation.

The evidence is present in many utilities where job

evaluation has been successfully used for many years, in the case of one group of companies for nearly 20 years. The unions involved are locals of the same internationals that represent other utility groups, plus some independents. Those union groups—12 in number—being familiar with job evaluation and being parties to the establishment of rate ranges through the process of evaluation, could not successfully "sell" a cents-per-hour adjustment to their own memberships. Hence, they do not demand it. And for 20 consecutive years wage adjustments have been percentage increases, and relative pay has remained precisely in accordance with relative job values.

It is very late, but it will never be earlier for industrial relations departments to prepare today for tomorrow's clean-up of wage inequities created—shall we say—by our predecessors.

A device which the industrial relations department should seriously consider as another way to prepare for tomorrow's problems involving both operating costs and employee morale is the use of financial incentives, and I do not mean a suggestion system.

One objective of a system of wage incentive plans is, of course, lower operating costs and greater efficiencies, fewer and better paid employees. But that is only the financial aspect of an incentive system which is focused

on and accomplishes several objectives which are important factors in employee morale:

- Provides an objective measurement of operations which assists supervisors in handling human relations and naturally results in discussions of such measurement with their subordinates.
- Forces methods improvements through the elimination of wasteful, undesirable practices which set a bad example for employee attitudes.
- Creates a competitive spirit between work groups and thereby improves group loyalties and the relationship between worker and supervisor. They are on the same team.
- Reduces or eliminates the need for close, "breathing down the neck" supervision, the avoidance of which improves production and morale.
- Forces organization changes which give greater responsibilities to non-supervisory employees.
- Provides a natural selection procedure which focuses attention on employees with unusual abilities, particularly foremen in charge of consistently high bonus groups.

Last, but certainly not least, industrial relations departments must tool up for a direct attack on the problem of employee morale.

A great many things which have happened to the last two generations of employees have had adverse effects on attitude and morale. To name just a few:

- Increased size of industrial organizations with the inevitable increased remoteness of management.
- Increased specialization and mechanization which from the employee's viewpoint have removed part of the sense of accomplishment and rendered some work insignificant.
- Careless selection of supervisory personnel resulting from the hectic reorganizations incident to rapid growth.
- Increased aggressiveness on the part of those labor leaders whose organizations and personal status thrive on conflict.

How much do we really know about the human being? How much do we know about the causes of aggressive or regressive behavior which change favorable attitudes to resentment and suspicion? How much do we know about the effects of the working organization on individual-small vs large work groups, close vs general supervision, employee-oriented vs company-oriented supervisors, permissive vs restrictive leadership, the effects of drawing employees into decision making, the possibilities of counseling? Very little!

There is a faint rustling of understanding of the morale problem throughout industry; and unless utilities are to lag behind, their industrial relations departments must organize now to cope with the complex analyses of human behavior. And the great majority of such departments are ill-prepared and inadequately staffed to do the job. A whole new set of management theories and practices must be devised which will use every concept of automation while at the same time utilizing, in a positive manner, the major forces which influence human behavior. Those do not include the paycheck or the fringe benefits.

The only way in which an industrial relations department can be properly staffed to attack the problem of employee motivation is by obtaining the services of competent industrial psychologists. The usual response to such a suggestion from corporate officers is, "But having a psychologist on our payroll would be pretty flossy." Then why do utilities have engineers on the payroll? Isn't that rather extravagant? The engineer is there to solve engineering problems. The industrial psychologist is just as essential to solve the equally or more complex social problems within an industrial organization, which problems, if not solved, will hamper the work of the engineer.

It is possible that some readers will consider the above proposals for preparing today's industrial relations department for tomorrow's problems too radical, too impracticable. Nothing has been proposed which has not been accomplished in a practical manner by public utilities. Although there are many other preparations which must be made, the proposals seemed appropriate for the limited space available.

Keep Employee Morale

J. S. VIEME, Jr, Assistant Director of Employee Relations, Pennsylvania Power & Light Co, Allentown, Pa.

Industrial relations administers many programs designed to keep employee morale at a high level.

Plans for selecting, hiring, placing, training, developing, and promoting as well as benefit plans such as insurance, hospital, and retirement need to be modified as the composition of the employee group changes from time to time.

In 1940, 48% of those of high school age graduated from high school, in 1956, 62%. College graduation figures show a similar trend. There is also a rising trend in the skill level needed by employers, probably because of automation and technical improvements which will produce a higher standard of living. This too will change the composition of the employee group.

New and improved personnel programs will be needed to maintain morale at a high level. Many problems will arise tomorrow which cannot be foreseen today. However, a few problems for tomorrow are now in evidence:

1. Nuclear power plants with government regulation of equipment and personnel as well as future union policy means that tomorrow's industrial relations men must be aware of nuclear developments for purposes of job descriptions, job classifications, and new working conditions.

2. The growing complexity of benefit plans is largely the result of tailoring a formula to meet the needs of small groups within a large group.

Industrial relations must prepare today for future complexity. The personnel man will need a practical knowledge of actuarial principles and understand communications in order to explain the additional complexities to tomorrow's employees.

3. The number of retired employees will increase steadily until about 1980 when it should remain constant. Electric utilities now have about 30,000 persons on their pension rolls—persons experienced in utility work. This growing force is potentially powerful and could be mobilized to improve employee, customer, and public relations.

Here then is tomorrow's opportunity. Personnel could initiate this program with benefit to both the pensioner and the company.

4. Fringe benefits, which exceed an equivalent wage cost of 50¢ per hour in many utilities, are designed to accomplish specific objectives. How well are the objectives attained? How many times do we hit the morale target?

Just as engineers run performance and acceptance tests on equipment, so personnel men must run performance tests on their programs.

We should prepare today to include a separate performance testing group. It should not be emotionally involved on "good" or "bad" points but should determine objectively whether a given program is meeting the objective.

People Are Individuals

H. F. FOSTER, Assistant Director of Employee Relations, Consumers Power Co, Jackson, Mich.

Time was when business was less complex and industrial relations was the sole responsibility of the line organization. In fact, originally there was only line organization. In recent years industrial relations has become a staff function. But there is still great need for industrial relations to continue as an integral part of the line function.

Year by year, as the subjects and fields of industrial relations become more complex, there is more and more temptation to get away from the line organization and make industrial relations a thing of and by itself. This is hardly good for the organization. Yet, to forestall this tendency requires great skill, practice, and particularly a correct mental concept. It calls for selflessness, leadership, diplomacy, and salesmanship. A vast amount of education of the line group also is essential. But it is important that the correct mental concept be kept in mind. The larger the planning and resultant programs become, the more important this is.

Generally speaking, industrial relations has involved safety plans and procedures, employment and recruitment, psychological testing, merit ratings, job specifications, position analysis, labor negotiations and contracts, and employee training, education, and communications. In some companies there have also been suggestion plans, work simplification programs, and programs of management inventory and development.

Industrial relations tends to become a mass or wholesale medium. Yet people are individuals. They cannot be treated solely as workers, supervisors, employees, or members of any group. Mass production furthered the idea of considering people as a mass. Automation, as a new technique of mass production, will tend to encourage this practice. Yet the larger a business organization becomes, the greater the need for individuals to have a sense of individuality—team members to be sure, but individual entities not just cogs in a machine.

To meet the demands to be made upon industrial relations, we should see that our own house is in order. Are we adequately staffed? Do our people in industrial relations combine the intellectual knowledge and curiosity to delve into and appraise the sociological and psychological aspects of human behavior? Are our people experienced and skilled enough to be down-to-earth and practical in their dealings with the line organization?

Complicated as the field of science and engineering is, is not "human engineering" equally complicated? Are our personnel people as well equipped to deal with the complicated human structure as are our engineers in the field of materials and design?

The future presents great challenge. Industrial relations must deal with individuals in great numbers and develop and utilize them to the fullest. We should know what the individual's potential is and what he needs for its development. Then he should be assisted. We should take inventory of our departments and see that we are equipping ourselves to meet the demands of tomorrow.

Must Help Make Policy

E. G. HUCK, Director Research and Training, Cincinnati Gas & Electric Co, Cincinnati, Ohio

Industrial relations department participation in the policy-making process is common practice in public utility companies where a highly developed and enlightened appreciation of human relations exists and where unilateral management decisions affecting the work force are restricted by labor legislation and collective bargaining agreements.

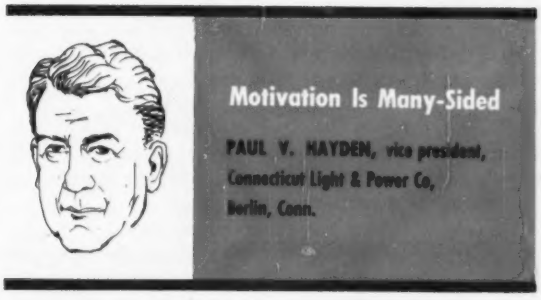
In keeping with the importance with which the role of the industrial relations department is regarded, its status in the policy-making group is comparable to operating and other major staff divisions within the organization. Excepting those functions for which the industrial relations department assumes line responsibility, its primary function in policy determination is to be informative and advisory. The reason: It evolved from the line organization's need for specialized assistance in matters pertaining to employee-employer relations. With respect to overall employee-employer relations the industrial relations department plays an important role in promulgating constructive policies.

By thus providing for due consideration of industrial relations in the formulation of policy, public utility companies clearly indicate general acceptance of the fact that satisfactory employee-employer relations are essential to the welfare of all concerned: the company, the employee, the stockholder, and the consumer.

Based on the theory that policy is an instrument of coordination and control over future action to be taken under repetitive conditions, formulation is not the end point in the policy determination process. Communication and interpretation to assure consistent and uniform application of policy on a companywide or departmental basis must also be given close attention.

Active participation in policy decisions by representatives of all departments—operating, engineering, sales, finance, industrial relations, etc,—in any company promotes understanding which, in turn, facilitates communication and interpretation.

In practice, the execution of company policy is a primary duty and responsibility of each executive, department head, and all subordinate management personnel. In its role as a participant in the policy-making process, the industrial relations department directs its activities toward making the line organization's control of employee-employer relations more effective.



Motivation Is Many-Sided

PAUL V. HAYDEN, vice president, Connecticut Light & Power Co, Berlin, Conn.

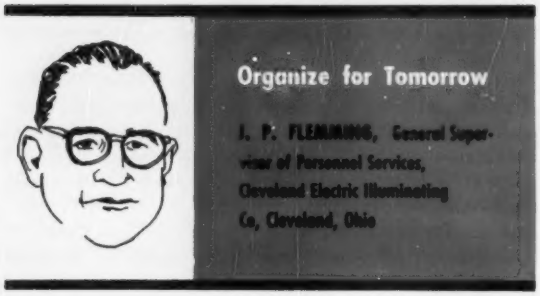
In a more primitive era, employee motivation was not considered much of a problem. The financial incentive of a paycheck, for a reasonably adequate amount, with the possibility of increasing reward for standout performance and the probability of decrease or loss of income for inferior performance, was thought to be enough inducement for anyone. As time passed, we have all grown in understanding. Though promise of success and threat of failure continue as basic drives in the American economy, we have come to realize that the things which motivate people are as varied and as complex as the people themselves.

Recent studies have revealed that for the newly hired engineer, principal motivation lies in the challenge of the job itself. For other professional groups, status and the desire for individual recognition can be most compelling. Among young people the opportunity for self improvement and for personal growth are of paramount importance whereas older workers are more concerned with economic considerations and the likelihood of future security. Thus, as we sharpen the focus, it becomes apparent that motivation is not a static thing; not only does it vary among individuals, but it may vary with the same individual at different stages in his career.

Perhaps one large employer came closest to defining the basic and common motivating forces when it reported that all workers want fair pay, a chance at advancement, extra job satisfactions, and, most important of all, security. Implicit in this concept of security are a good boss, steady work, adequate benefit programs, a sense of belonging, an opportunity to know what is going on and to have some voice in it, and assurance of individualized treatment.

It is clear; motivation of employees is a total management responsibility far too broad to be vested entirely in one individual or in a single department. It is equally clear, however, that the industrial relations department cannot help but be deeply involved in the various factors which bear directly on the execution of this responsibility. Collective bargaining and wage and salary administration exert a profound influence on the adequacy and fairness of financial incentives which the company may be offering.

The ability of the individual to take advantage of opportunity is often directly proportionate to the training, formal or informal, which the company has provided. The "good boss" who will respect the employee as an individual and, at the same time, impart a feeling of belonging to the larger group just happen; he is the product of informed selection plus of careful training.



Organize for Tomorrow

J. P. FLEMMING, General Supervisor of Personnel Services, Cleveland Electric Illuminating Co, Cleveland, Ohio

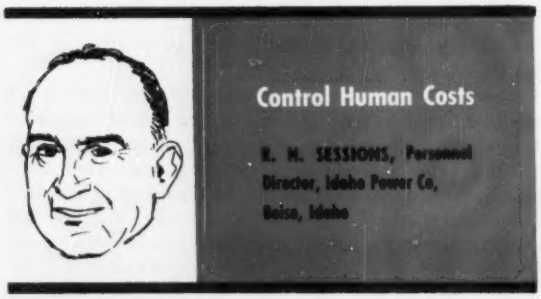
What will your organization plan look like ten years from today?

In its role as staff advisor to the line operation on employee relations activities, the industrial relations department must do long-range planning to be ready to recommend adjustments necessary in a company's organization to meet the ever-changing requirements of the company's growth. This is vitally necessary in the electric utility industry with its predicted doubling of output in the next ten years.

Growth and change—the coming of atomic power, other sources of power, increased transmission and distribution voltages—will require transition to new organization functions.

Some of the employee relations factors which will be affected by these transitions are:

- The constant adjustment of managerial techniques to meet the problems of decentralization of authority made necessary by growth.
- Ever-increasing productivity which will shorten the work week and complicate the problem of competition between an employee's job interest and his leisure-time interest.
- The necessity for sharpening communications techniques to keep employees informed of what is going on—employees who are becoming more and more accustomed to receiving instantaneous news on current community and national affairs via television and radio.
- A more careful selection of employees—employees with the ability to adapt themselves to technical changes, employees who will become the leaders of the future.
- Increased training activity to keep employees abreast of the changing skills necessary to operate tomorrow's equipment and to keep tomorrow's leaders abreast of changing managerial problems.
- Salary administration adjustments to keep employees motivated in the ever-increasing competition of the automation-minded world of tomorrow.
- The ever-changing social scene which brings new requirements for satisfying employees—unemployment insurance, increased health insurance, increased pensions.



Control Human Costs

R. H. SESSIONS, Personnel Director, Idaho Power Co, Boise, Idaho

We might as well face the fact that the key to industrial relations progress is the uncommon man. After all, there is no quick way to maturity. Therefore we must dedicate ourselves to the constant improvement of whatever talent we have. Cost control is a relentless objective that can only be reached through an Amazon of perseverance, patience, and plain stubbornness. Multiply these qualifications by the number of employees in positions where cost control is essential and you have the number of uncommon men required for a successful operation.

The degree of hostility with which cost control programs are received by employees may often be a measurement of the industrial relations program itself. But if a company has been successful in providing employees with a foundation of industrial faith and understanding, then cost control demands will be met with general acceptance. The reverse, of course, is also true.

When a company becomes concerned with whatever threatens or strengthens its cost control objectives, then it must become equally concerned with whatever threatens or strengthens its industrial relations program.

Employee thinking can be structured toward such programs by a mature administration of all the functions usually assigned to the industrial relations department. Where personnel programs are neglected or outmoded, excessive turnover rears its expensive head; and mediocrity takes over. On the other hand, if new employees are effectively recruited; intelligently selected; properly placed, indoctrinated, trained, counseled, encouraged, and kept healthy and happy through enlightened welfare programs, the result will be a capable, contented group which appreciates that what is good for the company is good for the employee. When the interests of the company and employee merge, cost control becomes a mutual problem to be solved to the advantage of all.

Committee Is on the Job

EEI Industrial Relations group serves as information center for the industry. Meetings are forums for discussion on national basis

J. C. ARNELL, Director Industrial Relations, Consolidated Edison Co of New York, Inc, New York

The growing importance of industrial relations as a factor in the successful development and utilization of human resources was recognized by the Edison Electric Institute more than a decade ago. At that time it established the Industrial Relations Committee to serve the electric utility industry in this fast developing field.

This growth is evidenced by the number of books, articles, organizations, meetings, and college courses dealing with the subject. The very fact that the Electrical World, leading publication devoted to the interests of the electric utility industry, accredits industrial relations by this issue of the magazine speaks for itself.

During the committee's lifetime there has been an acceleration and expansion of industrial relations that have brought professional status to the activities. "Industrial relations" used to be a line function. Today it is a staff department job.

Industrial Relations Is Many Sided

The committee regards industrial relations as that field devoted to the motivations, abilities, accomplishments, and security of employees. Involved are studies of problems and techniques in such major areas as wages, working conditions, benefits, legislation affecting employees, union relations, management development, and the myriad of problems involving the motivation of individuals.

In serving our industry in these areas, the committee must be alert to the many forces that are shaping the course of industrial relations of tomorrow: technological improvements, rising costs, multiplication of fringe benefits, labor legislation and decisions, and enlargement of "wages, hours, and working conditions." A new factor is the recent merger of the American Federation of Labor and the Congress of Industrial Organizations.

We read much about the advances in living predicted for the years ahead: higher earnings, more leisure time, and added luxuries. Key to the attainment of all of this, we are told, is greater productivity. This will have to be brought about by management through more efficient operation, automation if you will, and increased motivation of employees.

Increasing employee motivation is one of the important functions of industrial relations. In addition utilization of all employees in the most effective and efficient manner must be planned. High earnings have created a work force that cannot be motivated by the pay check alone. There must be a feeling of job satisfaction.

Management will look increasingly to the industrial relations department for guidance in how to develop and maintain this job satisfaction. It will have the important job of determining how best to give the the individual the will to work and at the same time leave with him a sense of fruition and contentment. Industrial relations people must be in a position to recommend to management policies that will encourage the employee to give his best toward a coordinated effort to the accomplishment of the goals of the company. This is a job that requires an understanding of the implications of today's actions on tomorrow's industrial relations.

Industrial relations of tomorrow will be involved with many problems which stem from the union's efforts to get a greater share of the results of accelerated technological improvements. This will run the gamut from more leisure time to the broadening of welfare benefits and extending them to dependents and pensioners—all at company cost.

Jobless wage benefits will give further momentum to stabilization of the work force, a problem that might not be too serious for our comparatively stabilized industry, stabilization of the work force, a problem that might not changing character of the work force with its increasing proportion of skilled workers.

Management Looks to Industrial Relations

Industrial relations men must help management run the business free from ineffectual supervision or infringement by unions. For some time the electric utility industry has been bargaining in a rising economy. Unions in their continuing drive for security for themselves and for individual members have been successful in obtaining concessions in the form of restrictive contract clauses that they might not have otherwise obtained if we had been going through a stable or falling economy.

Industrial relations should also be prepared to recommend what action management might take in the event of a change in the economic trend. Should management first try to correct or eliminate some of the restrictive working conditions that have crept into contracts, or should management aim toward eliminating some of the practices that no longer follow the basic principles for which they were established? At the same time unions must be convinced that they have a responsibility to give up some of their past privileges in a declining economy. Management looks to industrial relations to meet such problems.

Industrial relations people will have two other matters to be concerned about, unionization of professional people and political activity of unions. Union activities in these areas can prove matters of management concern.

New problems, yet unknown, will be a challenge to us. Industrial relations people will have the important job of determining how to meet the problem.

Basically, the EEI Industrial Relations Committee serves the industry like an industrial relations department does the individual company. However, the Industrial Relations Committee does not make policy. Its primary function is to keep the industry informed about significant developments in the industrial relations field and to provide a means of information exchange for member companies.

Committee Continually Makes Studies

The committee is constantly making studies in connection with current problems and new techniques or changes. These changes may be the result of trends or may be brought about by union negotiations, legislation, or decisions of the various government agencies having jurisdiction in labor matters.

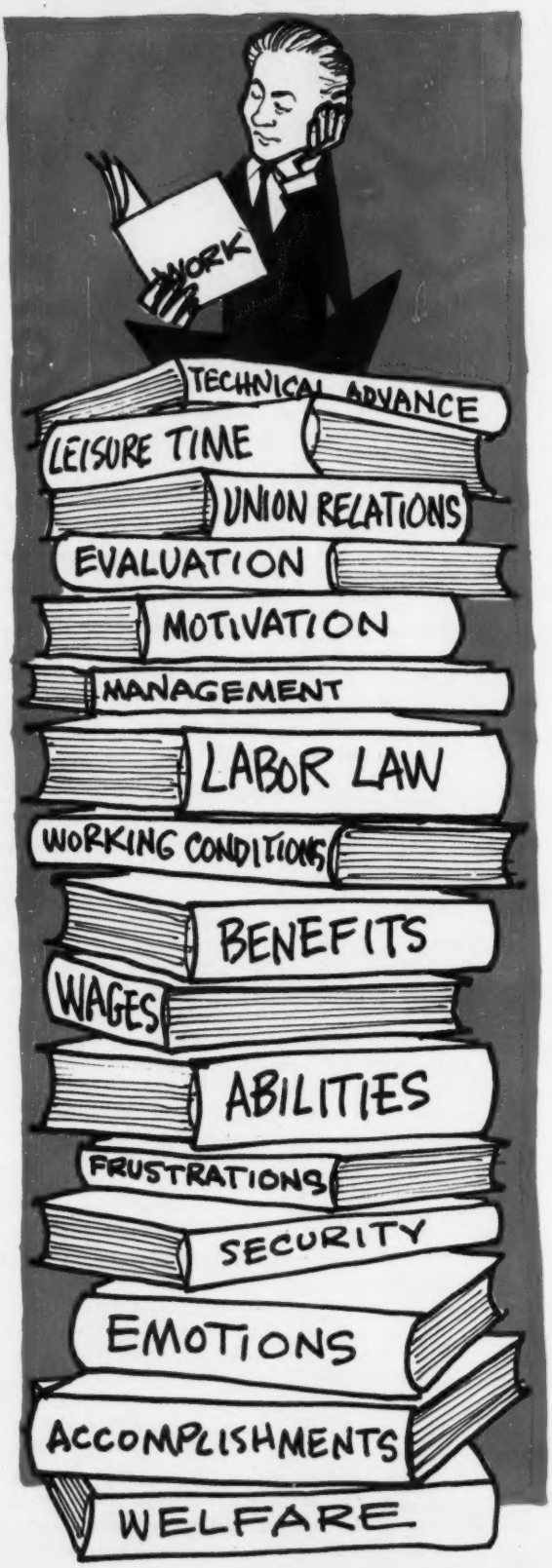
The committee has a number of basic approaches for fulfilling its objectives for the industry. In rendering its services, it must be clearly understood that it is not the committee's purpose nor is it the industry's desire to create anything like an atmosphere of industry-wide patterns or industry-wide bargaining.

Committee Is Information Exchange

On the contrary, the Industrial Relations Committee is a medium for the exchange of information through surveys which are conducted as required. Further opportunities for exchange of information occurs at regular committee meetings and other meetings co-sponsored with other groups. The widely attended Annual Round Table Conference held every fall offers operating and administrative, as well as personnel people, an opportunity to discuss on a national basic problems of the industry and to learn from the experiences of others.

Those of us in industrial relations must keep a vigilant eye on the many changes in or affecting industrial relations. Future industrial relations policies of the nation's industries might well be the determining factor whether we in this country can stave off such developments as codetermination, government ownership, or socialistic government policies that have gained a foothold in foreign countries.

We can not live on a day-to-day basis. The tremendous changes occurring in the makeup of the work force and attitudes towards employees as human beings who must be given something more than a pay check means that industry must continue to look forward. We must plan for more skilled workers, future supervisors for the new era, and management replacements with a broad general knowledge of the business and of human relations. There must be firmness, yet fairness, in our dealings with the unions. Management must retain its right to manage. It must stay away from a "peace at any price" philosophy when faced by stubborn unrealistic demands from the unions. Management must continue to seek areas where it can introduce improvements that will mean progress for the individual as industry progresses.



MEETING TOMORROW'S DISTRIBUTION NEEDS

Advanced system design overcomes geographical difficulties, helps Southern Colorado Power to . . .

KEEP AHEAD OF RISING RURAL LOAD

How does an electric utility serving thousands of square miles of irrigated farm land and rugged Rocky Mountain terrain, plus scattered urban centers, supply a steadily growing list of customers and prepare for future growth?

This challenge confronts the Southern Colorado Power Company, whose load has soared from 150 million kw-hr in 1950 to 270 million kw-hr in 1955.

Assistance in meeting the challenge was provided by comprehensive studies on the General Electric system analyzer. Result? Southern Colorado Power Company engineers are utilizing higher distribution voltages — 13.2 kv — and, a 69-kv transmission loop is under construction around Pueblo to improve service continuity and increase capacity for the urban-rural area.

TURN PAGE FOR MORE DETAILS ▶

MORE POWER TO AMERICA

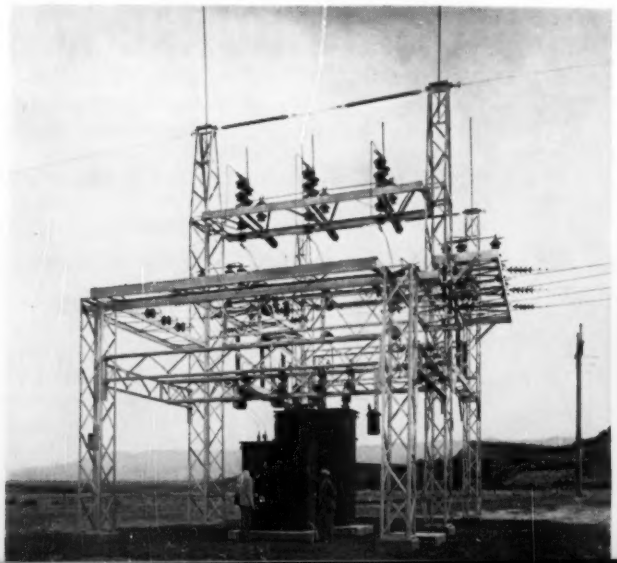
GENERAL ELECTRIC

MEETING TOMORROW'S DISTRIBUTION NEEDS

SYSTEM FLEXIBILITY is enhanced by Southern Colorado Power Company's West Station, a new General Electric substation. This huge installation ties 115-kv and 69-kv systems together. Examining the unit l. to r., Southern Colorado Power Company engineers, Howard E. Reader and George D. Perry, Jr., D. B. Hyer, Jr., Pres. of Southern Colorado Power Company and Vice Pres. W. C. Porter, Jr.

NEW STREET LIGHTING forms part of Pueblo's commercial load. These lights are General Electric Form 400 Luminaires equipped with 20,000 lumen mercury lamps.

NEW SUBSTATIONS help serve growing rural load. This modified General Electric compact rural package unit receives power at 69,000 v and serves a 7620/13,200Y-volt distribution system.



CAREFUL SYSTEM PLANNING helped Southern Colorado Power make optimum use of best possible design. L. to r., Southern Colorado Power Company's Horace H. Tureman, planning engineer; Vincent J. Isele, Jr., relay engineer; and Howard E. Reader, chief engineer, work out a design problem.

Southern Colorado Power plans system growth through higher voltages, new substation

General Electric apparatus aids system flexibility, continuity

In the face of adverse geography, Southern Colorado Power Company engineers have found that practical system design for flexibility, plus standard General Electric equipment for maximum reliability, are of prime importance.

In keeping with this, Southern Colorado Power Company is making greater use of 13.2 kv for distribution and now much of the system is efficiently served by this voltage. In addition, a huge new substation switching center with a 25,000-kva, 115/69-kv General Electric autotransformer will be employed to link Southern Colorado Power Company's 115-kv and 69-kv systems together for increased system-wide capacity. In Pueblo, a 120/208Y-volt underground network system has been implemented with two 500-kva network transformers as the first installation. Now, economical expansion can be accomplished with a minimum of engineering.

To activate their plans, Southern Colorado Power decided to utilize the best equipment available, therefore selected from General Electric's complete line.

When you, like the Southern Colorado Power Company, specify General Electric, you take advantage of the latest advances in apparatus design, construction and application. That's because General Electric engineers are able to translate the trends and needs of growing systems as reported by field personnel, incorporate newest materials and manufacturing techniques in producing them, and provide help in putting these advances to best possible use on your system.

And to help utilities keep service running smoothly, experienced General Electric service engineers plus a nationwide network of Service Shops stand ready to meet any and all maintenance and repair needs—day and night.

For full information on distribution equipment and distribution system services, contact your nearby General Electric Apparatus Sales Office, authorized Agent, or equipment distributor today. Or write General Electric Company, Section 303-3, Schenectady 5, N. Y.

TURN PAGE FOR MORE ON MEETING TOMORROW'S DISTRIBUTION NEEDS

MORE POWER TO AMERICA

GENERAL ELECTRIC

RELIABLE EQUIPMENT such as this 25-kva General Electric pole-type transformer at the Royal Gorge, shown in center foreground, minimizes maintenance in difficult terrain, helps cut costs. This installation furnishes power for restaurant and tourist facilities on site of the country's highest suspension bridge.

MOBILE METER LABORATORY facilitates installation and service of General Electric I-55 S meters in rural areas. Reliability of these meters proves to be a cost-saving factor. R. J. Ikelman, left, and Bennett Short, superintendent of Southern Colorado Power Company's Meter Service and Installation Shop accompany the truck on one of its field trips.

MEETING TOMORROW'S DISTRIBUTION NEEDS

7,500,000-VOLT DIRECT STROKES repeatedly applied to 37-kv Thyrite station-type arrester in the General Electric High-Voltage Laboratory at Pittsfield, Mass. Such research was a vital factor in the development of Thyrite* Magne-valve arresters.

How General Electric product development aids utility system planners

Research and product development at G.E. is a never-ending search for more efficient apparatus. For example, out of 10 years of research, came magne-valve arresters which give as much as 20% more protection and permit reduction of insulation levels by two steps on power transformers. The goal of this work is to provide utilities with new equipment to meet tomorrow's operating conditions most effectively.

G-E distribution system services include headquarters system planners—district application and product engineers—extensive product development facilities—equipment installation and field-service engineering. These services offer assurance of maximum operating continuity, on-the-spot application help, equipment efficiencies, valuable help in system design and techniques. Get the full story from your G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

More Reasons Why It Pays to See General Electric About Distribution Problems

EXCHANGE OF IDEAS among electric utility engineers is frequent at General Electric. Forums and discussions help resolve field problems, keep engineers abreast of latest developments.

ENGINEERING STUDIES AT G.E. include Power Systems Engineering, Electric Utility Systems Course, board studies. Above, utility company men visit a G-E factory as part of their course.

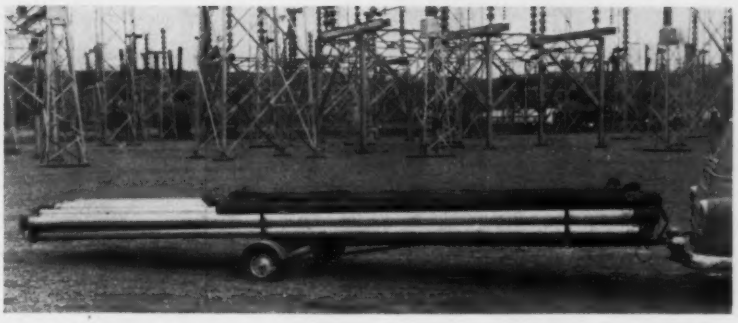
CO-OPERATIVE ENGINEERING is exemplified by G.E.'s application engineers who work closely with utility engineers on system design and equipment, help advance utility operation.

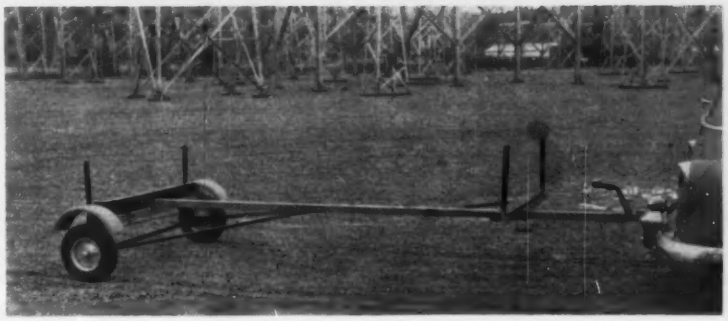
**Registered Trademark of the General Electric Co.*

SUBSTATION—Maintenance

Trailer Saves on 330-Kv OCB Inspection

C. L. ROBISON JR, Electrical Engineer, System Station Department, Appalachian Electric Power Co, Roanoke, Va.





Use of modified trailer for hauling pipes which are loaded by two men and assembled by two others, has proved a man-hour saver in the maintenance of Philip Sporn station 330-kv oil circuit breakers.

Such maintenance requires hauling and laying considerable piping as only one pair of oil standpipe valves is available for draining and filling breaker tanks. Twin portable oil lines (4-in. aluminum pipe) are used—one for removing and one for refilling breaker tanks. To reach the farthest breaker, 950 ft of portable oil line is needed, 41 20-ft lengths of 4-in. aluminum pipe; four 14-ft lengths of 4-in. composition hose; one 10-ft and two 14-ft lengths of 3-in. hose, and snap-on fittings.

Saves 10 Man-Hours

Formerly installation and removal of this portable oil line required 32 man-hours. Before breaker inspections or adjustments could be made, four men had to work 4 hr carrying and installing the portable pipes. Time is an all-important factor in all breaker maintenance, as station conditions must be restored to normal as soon as possible.

Use of the modified trailer has reduced the time of installing the portable pipes to 1½ hr, and saves 10 man-hours. Another 10 man-hours are saved in removing the pipe after a maintenance job, making a total saving of 20 man-hours, or 62½% saving in labor expense for this operation.

Changes Were Simple

The modified trailer was made by simple changes of a trailer having 300-lb capacity. The wheel assembly, consisting of 4-ply 4.8/4.00-8 tires and coiled springs, was moved back to the end of a 12½-ft tongue. An old crossarm covers the rear cross member. The front cross member was made from two 1½-in. angle irons covered by a 2x4. Side stakes (18 x 1-in. aluminum tubing) fit into 1¼-in. pipe bosses welded to the cross members.

Limited to Yard Use

The trailer used only inside the station yard is not registered for highway use. Besides hauling oil pipe, it may be used for transporting scaffolds, interrupter baffle stacks, and other parts of breakers during breaker maintenance. For these supplementary purposes, a removable wooden bed can be fitted over the cross members between the side stakes. The trailer may be dismantled or assembled in short time.

Tests of the trailer were made when it was loaded with 21 lengths of 4-in. aluminum pipe and five lengths of hose to determine maneuverability and effect of overloading. The 400% (approx.) overload, which exceeds the normal required load, compresses the coiled springs completely. But that is of little consequence as the trailer is to be used only inside the Sporn plant yard over level slagged surfaces.

The modified trailer was made at a cost of $95 for the original trailer plus $40 for time and material.

Loads of 800 to 1,000 lb can be safely handled on this trailer within the 330-kv switchyard with considerable savings in time and expense. Costing $135, the trailer saved 20 man-hours on just one 330-kv breaker job and can be used for many other jobs that require considerable manual haulage.

(*More How To on page* 92)

VOLTAGE REGULATORS

PROFITABLE VOLTAGE REGULATION

to help solve your distribution problems

NEW SIMPLE EXTERNAL ADJUSTMENT of regulating range, made on the pole without de-energizing, *increases current capacity* up to 160% of rated amperes.

Select Desired Regulating Range With New Position Indicator	Current Capacity of ML-32 Increases* (Shown as percentage of rated current)
± 10%	100%
± 8¾%	110%
± 7½%	120%
± 6¼%	135%
± 5%	160%

*To a maximum of 400 amperes

NEW CONTROL PANEL has been redesigned in order to make inspection easier and more accurate. This means you can reduce maintenance costs by using ML-32 regulators.

With NEW G-E LOAD BONUS POSITION INDICATOR you can now

INCREASE CAPACITY WITH REGULATOR ENERGIZED

NEW LOAD BONUS switch located in the position indicator of the redesigned General Electric ML-32 step voltage regulator now permits simple, one-man, on-the-pole adjustment of current capacity and regulating range *without de-energizing* the regulator. With "raise" and "lower" settings independently adjustable, current capacity up to 160% of normal at ±5% regulation is available up to 400 ampere maximum. ***Load Bonus is now standard equipment on all G-E pole and station-type single-phase step regulators.***

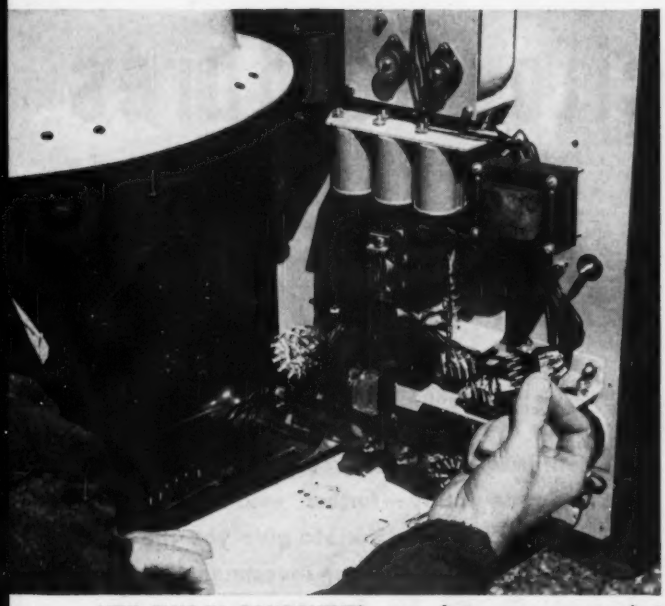
OTHER NEW FEATURES that mean increased dependability, accuracy, and economy include quickly interchangeable plug-in control components; internal channel design for easier, safer untanking by one man; and a larger, clearer tap position indicator for improved visibility. These features, shown in detail on these pages, make this the most advanced step regulator on the market today.

UP TO 50% SAVING in first cost, compared with all other types of feeder or station regulating equipment, is an additional benefit of the new G-E ML-32 step regulator. A complete line is available —25 to 167 kva and in five voltage classes.

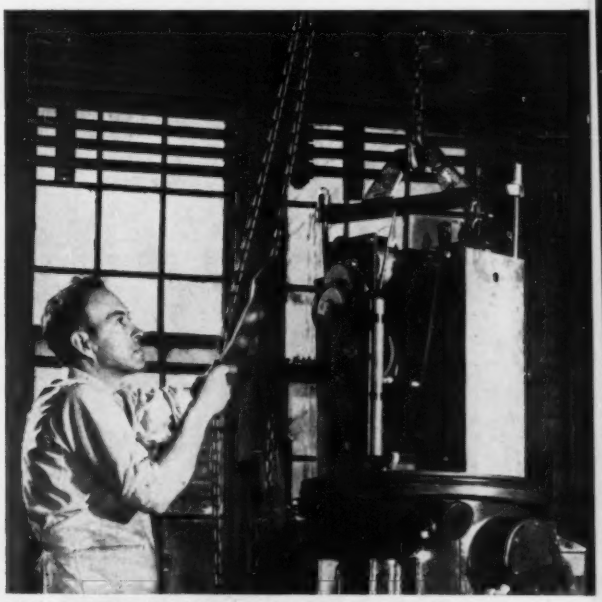
COMPLETE INFORMATION is contained in a new bulletin, GEA-5752. For your copy, contact your G-E Apparatus Sales Representative, or write to General Electric Company, Section 423-14, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

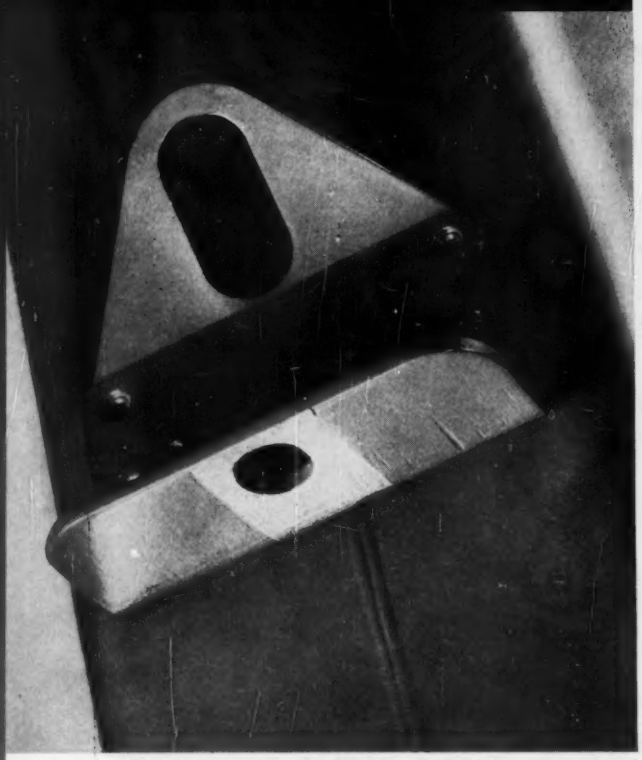


NEW PLUG-IN COMPONENTS mean faster, more economical maintenance. Voltage-regulating relay, line-drop compensator, time-delay relay, and the control panel itself all have quickly removable plug-in connectors.



NEW EASY UNTANKING speeds maintenance. Entire regulator is a one-piece assembly mounted between protective supporting channels. Lifting eyes at top of channels allow quick, safe removal by one man.

1 POSITIVE GROUND

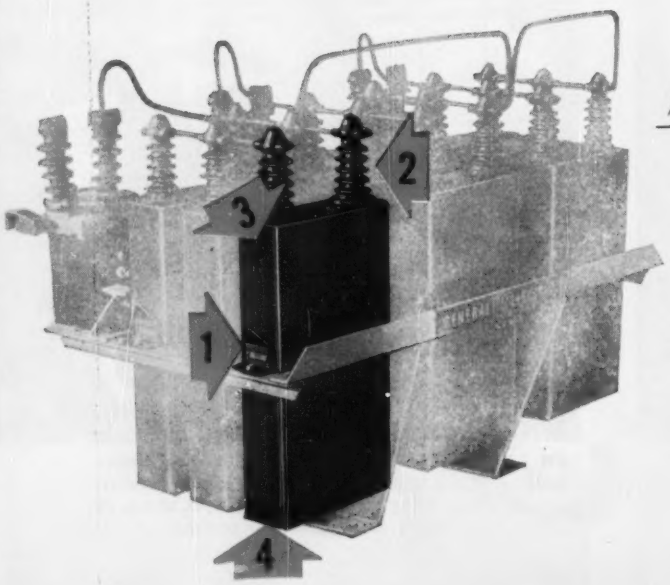


Permanent grounding is assured through an unpainted area on the bottom of the mounting bracket. Each capacitor bracket is welded to the case at eight points to provide maximum strength for hoisting and mounting.

2 PERMANENT CONNECTION

This new bushing and terminal assembly combines excellent electrical and mechanical characteristics. It accommodates aluminum or copper conductors in a 1000-lb. grip that compensates for cold flow.

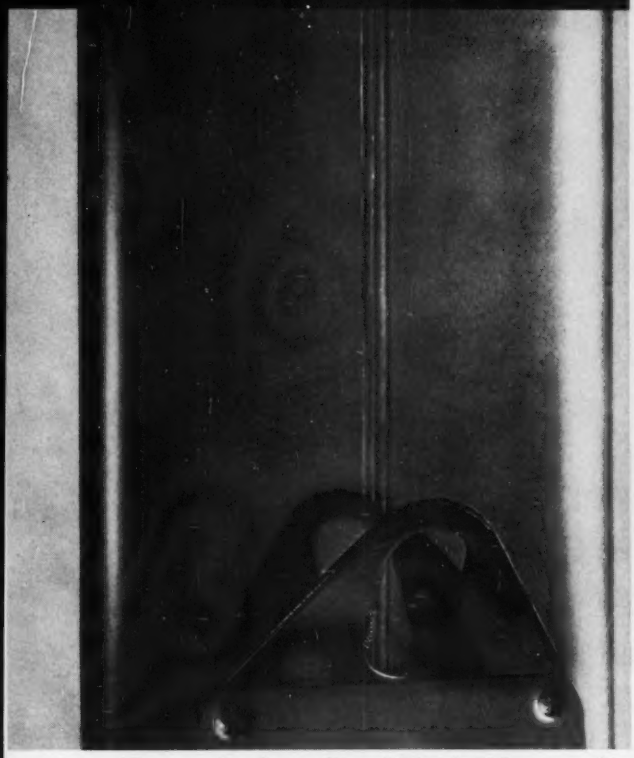
Four capacitor features



Engineered Extras

● of General Electric's 50-kvar capacitor make this unit and the equipments in which it is used the most efficient and economical source of kilovars available today—further evidence of General Electric's efforts to give you the most for your capacitor investment.

3 PRECISION WELD



The case of each new General Electric 50-kvar capacitor is automatically welded to provide a seam of controlled quality and uniform strength. In fact, this precision welded, hermetic seal is as strong as the case itself.

4 RECESSED BOTTOM

Recessed bottoms reduce scraping of the protective coating during warehousing and installation. This construction also prevents rain drops from collecting on the bottom of the capacitor and corroding the case.

that make a difference

The new General Electric 50-kvar capacitor—first of its rating in the industry—gives you these important Engineered Extras along with:

Less Weight Per kvar. One 50-kvar capacitor weighs 15% less than two 25-kvar capacitors. In switched equipments this provides an even greater weight saving—up to 25%.

Lower Cost Per kvar. One 50-kvar capacitor costs 10% less than two 25-kvar units. In switched equipments costs can be reduced even more—up to 25%—since a 600-kvar equipment needs no more switches than a 300-kvar equipment.

Because of General Electric's intensive capacitor research, capacitors have been continuously reduced in price. Today, the 50-kvar capacitor costs only $3.82 per kvar, or 55% less per kvar than capacitors of 20 years ago. For complete information about them, contact your G-E Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y.

441-36

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GENERAL ELECTRIC

Device Warns of Pipes in Hole Digging

JAMES F. KELLEY, Seattle City Light, Seattle, Wash.

Damage to underground water or gas pipes by mechanical hole diggers has been almost eliminated through use of a detector and alarm device by Seattle City Light. The device is so effective that three other City Light diggers have been equipped.

Elimination of damage to pipes means a saving of about $650 annually, which City Light has paid to replace broken water pipes. The device is especially useful during work near residential properties where underground lawn sprinkling systems, or water and gas pipes are likely to be encountered.

Pipes Complete Circuit

Experience has shown that most pipes are broken when the boring auger is raised to throw off the dirt, not during actual digging. The device gives an alarm when the auger contacts a pipe to close a circuit.

Basic components in the detector and alarm device are a double-point holding relay, horn relay, 6 to 8-v door bell, indicating light, switch, and 6-v battery. Circuitry is shown in the diagram. All components, except the battery, are housed in a metal box.

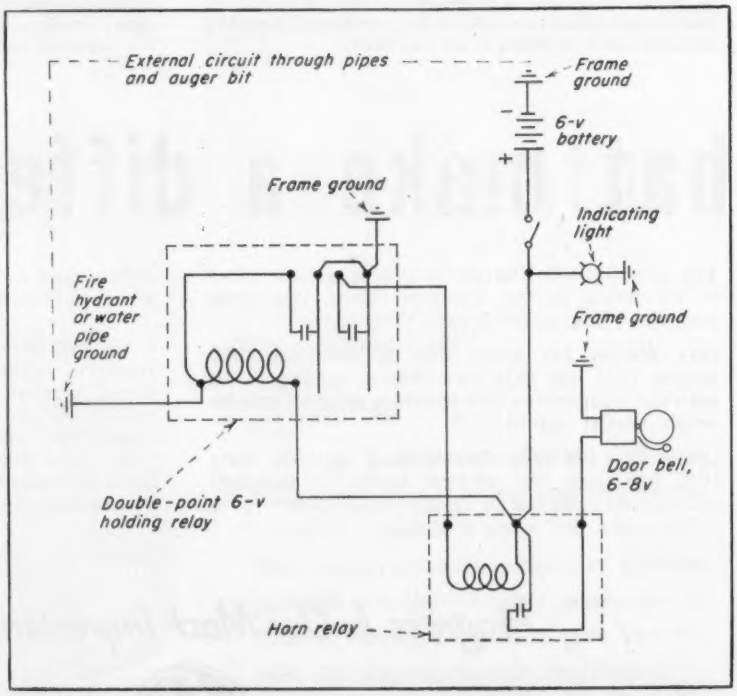
To put the device in operation, a lead is attached to a fire hydrant or customer's water pipe near the hole to be dug. Then the switch is closed to provide a circuit through the digger trunk frame to energize the indicating light. The external circuit, made when the auger touches the earth, does not permit sufficient current to flow to actuate the holding coil because of the high resistance of the earth path.

Operator Stops Auger

Should the auger contact a pipe, however, the resistance is reduced sufficiently to allow enough current to flow to close the holding relay. This actuates the horn relay and closes the circuit to the door bell. The bell rings until the switch is opened. When the alarm sounds, the operator stops the auger quickly to prevent damage.

Patent rights to this device are being obtained by the author.

EXTERNAL LEAD for alarm device is connected to customer's water-pipe before the digging begins. Device is valuable during work near residential properties



ALARM CIRCUIT rings the bell when auger contacts buried pipe but not when it is digging or touching the earth. Indicating light shows device is energized

DISTRIBUTION—Design

Air-Photo Overlay Estimates Acreage

J. W. VAUGHAN, District Commercial Manager,
W. RALPH NAFF, Draftsman, Senior, Appalachian Electric Power Co, Fieldale, Va.

A transparent overlay ruled in squares representing 1 acre each gives a good degree of accuracy in estimating the acreage of any portion of an aerial photograph. Photograph and overlay must be made to the same scale. Aerial photographs are customarily used to show prospective industries available sites in an industrial development.

Any number of black-and-white transparent reproductions of the original overlay can be made. They eliminate the smearing of ink on celluloid overlays during the handling, and permit giving each prospect a copy of the desired aerial photo with an overlay for estimating acreage of any parts.

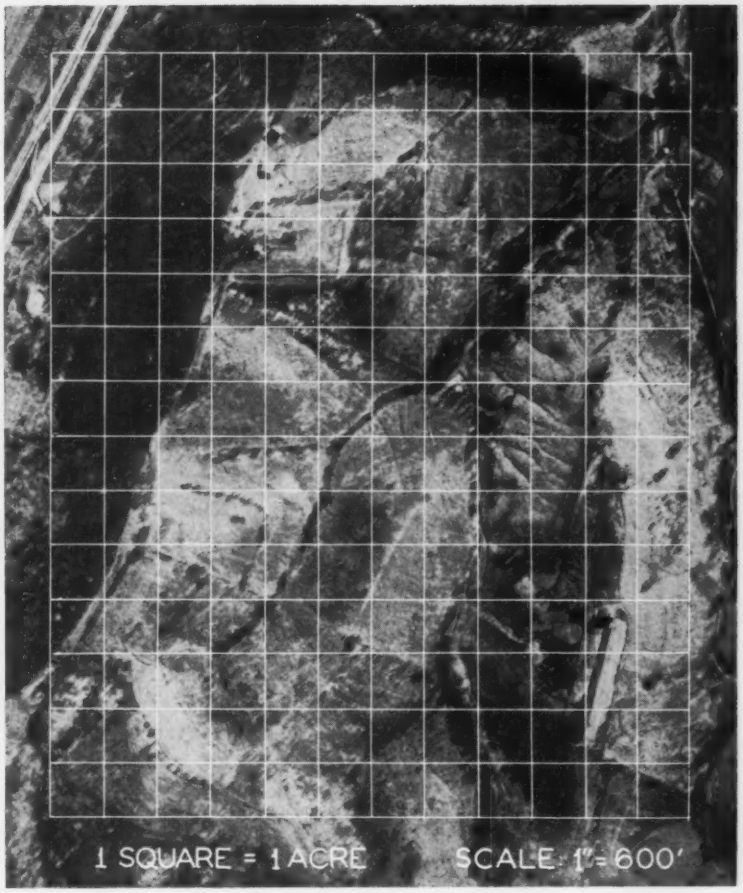
This method of estimating acreage, used extensively by Appalachian Electric Power Co's commercial department, has several advantages:

1. It eliminates need of the planimeter. Although use of a planimeter gives more accurate results, such instruments cost $34 to $350 and a mechanical integrator as high as $850. Such an outlay for each district or even each division would hardly be justified for area development alone.

2. It is economical. Original overlay can be made in less than an hour and transparent reproductions cost about 12¢ each. Overlays can be speedily used in the field or office. Sufficiently accurate estimates of acreage can be made by placing the overlay on aerial photos and estimating excluded area.

3. It is adaptable. Overlays can be made to any scale to correspond with that of the photograph to be studied.

4. It is accurate. This does not imply that the overlay is more accurate than an engineer's scale. The authors, however, vouch for the speed and near accuracy of overlay estimates, as no calculations are required.



SUBSTATION—Operation

Accidental Tripping Avoided by Red Warning on Relays

MARIS H. HALL, Engineer, Relay & Communication Department, Indiana & Michigan Electric Co, Marion, Ind.

Labels conspicuously marked with a small piece of red plastic tape readily observable warn Indiana & Michigan Electric Co relay and station personnel of relays that deserve special attention. This precaution has been helpful in preventing accidental tripping of major equipment.

Operation of some relays, such as differentials, trip major equipment and sometimes an entire station. Usually these relays have special functions involving several circuits, or are relays whose tripping can be transferred by station switching operations.

(*More How To on page* 98)

132 KV. SORENSON PHASE #1 IAC		132 KV. "B" BUS DIFF. PHASE #1 IAC ■	
C. T. Ratio 120/1	Amps. to Trip 960	C. T. Ratio 80/1	Amps. to Trip 400
P. U. Amps. 8a	Relay Type IAC-54	P. U. Amps. 5a	Relay Type IAC-55
Cycles 64	Symbol No. 51B	Cycles 4	Symbol No. 87B

NETWORK
TRANSFORMERS
Low-height permits small vaults

NEW LOW HEIGHT

makes General Electric network transformers ideal for Illinois Power Company's new system

The new General Electric network transformers, recently selected by the Illinois Power Company for its first secondary network system at Decatur, Illinois, stand only 61 inches high.

Such low height makes it possible to reduce vault size to the minimum, reducing construction costs. Or you can take advantage of the low height to install additional equipment in a normal-size vault. Illinois Power, for example, selected G-E units to permit installing rack-mounted secondary capacitors if load growth requires additional capacity in the future.

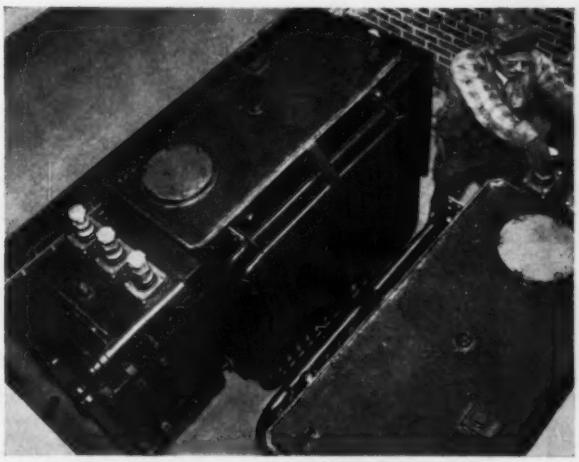
OTHER ADVANTAGES—New G-E low-height network transformers also offer simplified maintenance and increased reliability. You can easily clean the tubes, for example, by pushing a long-handled brush between the banks of radiator tubes, either from the top or from the ends of the transformers. And you can repaint the transformers in the same way.

The new transformers offer increased reliability because wing design reduces the chance for corrosion to start. Radiating surfaces are mostly vertical, not horizontal, and corrosive elements—water, sewage, etc.—do not readily collect on the radiators. Furthermore, the units feature balanced thermal design, giving reduced hottest-spot temperature rises throughout the transformer core-and-coil structure for increased transformer life.

FOR HELP in solving your network problems and for complete information on the advantages of low-height G-E network transformers, see your local G-E sales representative. General Electric Company, Schenectady, N. Y. 435-8

LIVE BETTER ELECTRICALLY

FIRST OF FOUR General Electric low-height network transformers to be installed in the largest vault on new network system of Illinois Power Co.



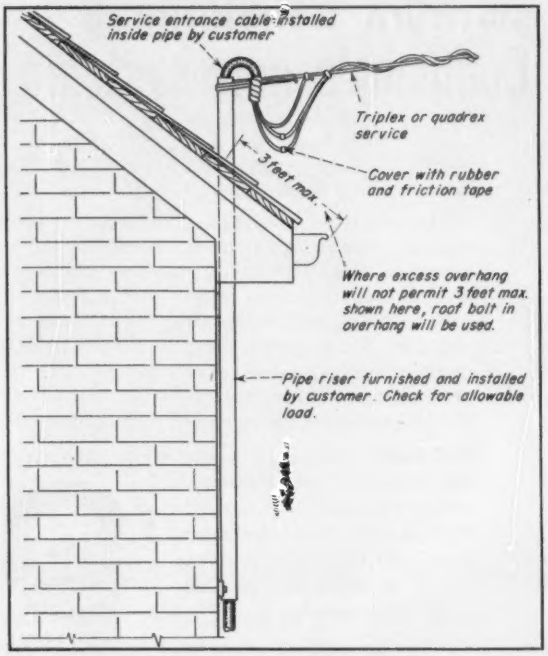
CONNECTING CABLES to network protector. Compact low-height design allows for future installation of secondary network capacitors in minimum vault space. This saves on construction costs.

Progress Is Our Most Important Product

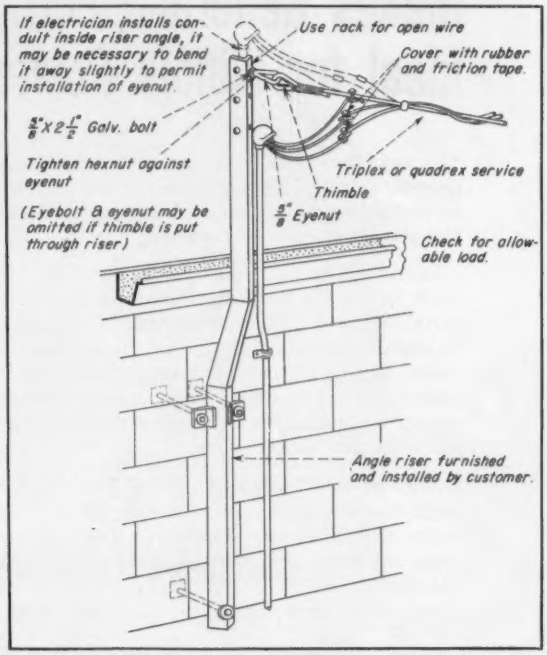
GENERAL ELECTRIC

Service Connections at Buildings

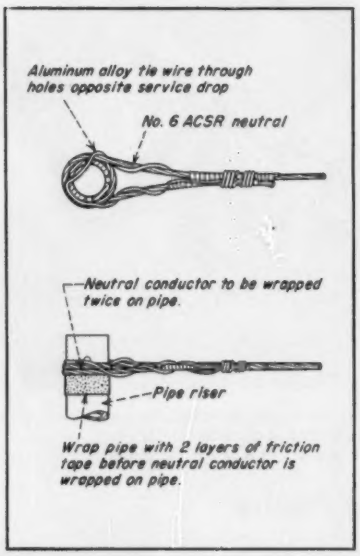
Attachments to pipe service riser and angle service riser, also deadends for ACSR neutral on pipe riser and on service drop-hook, are adapted from Overhead Lines Manual of Detroit Edison Co.


Service entrance cable installed inside pipe by customer
Triplex or quadrex service
3 feet max.
Cover with rubber and friction tape
Where excess overhang will not permit 3 feet max. shown here, roof bolt in overhang will be used.
Pipe riser furnished and installed by customer. Check for allowable load.

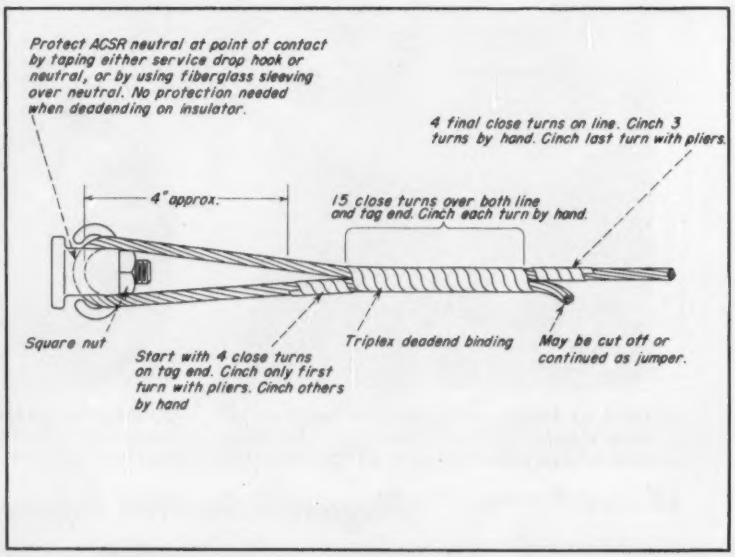
1. Attachment to pipe service riser


If electrician installs conduit inside riser angle, it may be necessary to bend it away slightly to permit installation of eyenut.
Use rack for open wire
Cover with rubber and friction tape.
5/8" X 2 1/2" Galv. bolt
Tighten hexnut against eyenut
Triplex or quadrex service
Thimble
(Eyebolt & eyenut may be omitted if thimble is put through riser)
5/8" Eyenut
Check for allowable load.
Angle riser furnished and installed by customer.

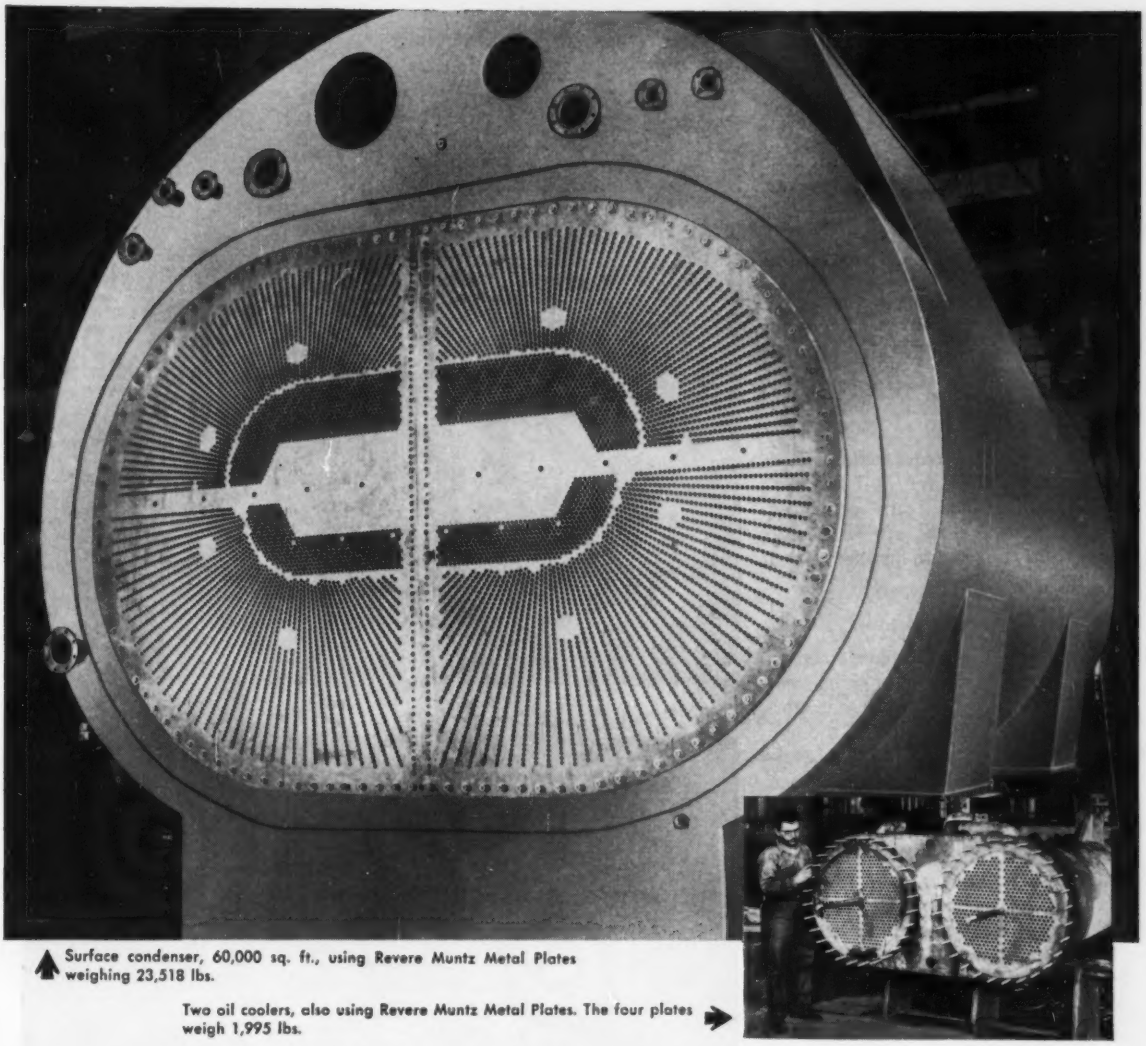
2. Attachment to angle service riser


Aluminum alloy tie wire through holes opposite service drop
No. 6 ACSR neutral
Neutral conductor to be wrapped twice on pipe.
Pipe riser
Wrap pipe with 2 layers of friction tape before neutral conductor is wrapped on pipe.

3. Deadend of ACSR neutral on pipe riser


Protect ACSR neutral at point of contact by taping either service drop hook or neutral, or by using fiberglass sleeving over neutral. No protection needed when deadending on insulator.
4 final close turns on line. Cinch 3 turns by hand. Cinch last turn with pliers.
4" approx.
15 close turns over both line and tag end. Cinch each turn by hand.
Square nut
Start with 4 close turns on tag end. Cinch only first turn with pliers. Cinch others by hand
Triplex deadend binding
May be cut off or continued as jumper.

4. Deadend of ACSR neutral on service drop hook; it is served with close turns of binding



▲ Surface condenser, 60,000 sq. ft., using Revere Muntz Metal Plates weighing 23,518 lbs.

Two oil coolers, also using Revere Muntz Metal Plates. The four plates weigh 1,995 lbs. ➔

LARGE PLATES FOR CONDENSERS

. . . SMALL FOR OIL COOLERS

REVERE SUPPLIES THEM BOTH!

These two pictures offer a great contrast in the size of the equipment. The large condenser has 60,000 square feet of surface, the small oil coolers only 1,100 square feet. Both were made by Westinghouse Electric Corporation, Steam Division, Philadelphia, Pa., for the Columbus & Southern Ohio Electric Co., Columbus, Ohio. Revere supplied 23,518 lbs. of Muntz Metal plates for the condenser. There are four plates, 113½" x 153" x 1¼" thick, hot rolled and leveled, cut to pattern. The oil coolers required four Muntz Metal circles, weighing 1,995 lbs. Two are 35¼" in diameter and 1¾" thick, and two are 31¾" in diameter by 2" thick. The units are for the utility's Picway generating station, for use with a 100,000 kw. turbo-generator.

Revere supplies condenser and heat exchanger plates and tubes in all the usual alloys, including not only Muntz Metal, but Admiralty Metal, Aluminum, Bronze and Brass, and Cupro-Nickel. The latter is especially advisable for difficult water conditions, such as salt, brackish or heavily contaminated water. Selection of the correct alloy to meet actual operating conditions may at times be a problem. Consult Revere. We will be glad to collaborate on such matters, and recommend the alloy most likely to serve long and economically. See the nearest Revere Sales Office.

FREE. Send for your copy of the informative booklet, "Life Extension for Condenser Tubes." Contains much basic technical as well as practical information for designers and plant operators.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

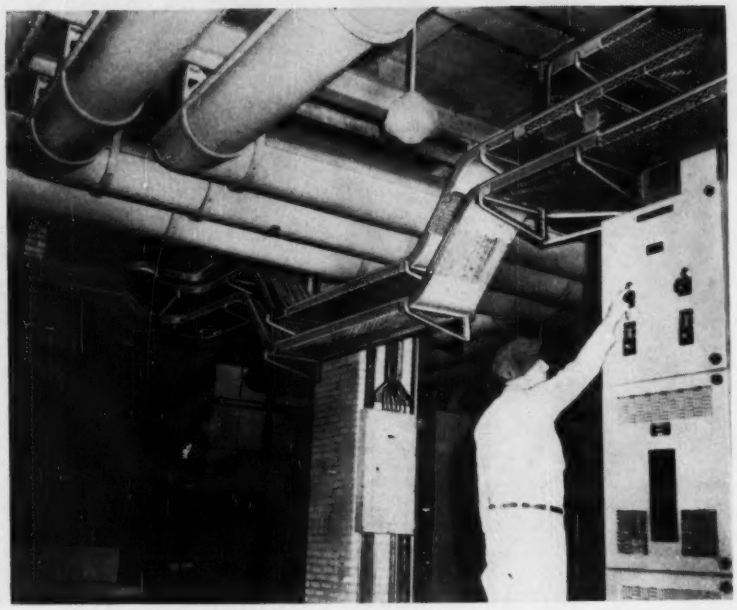
• • •

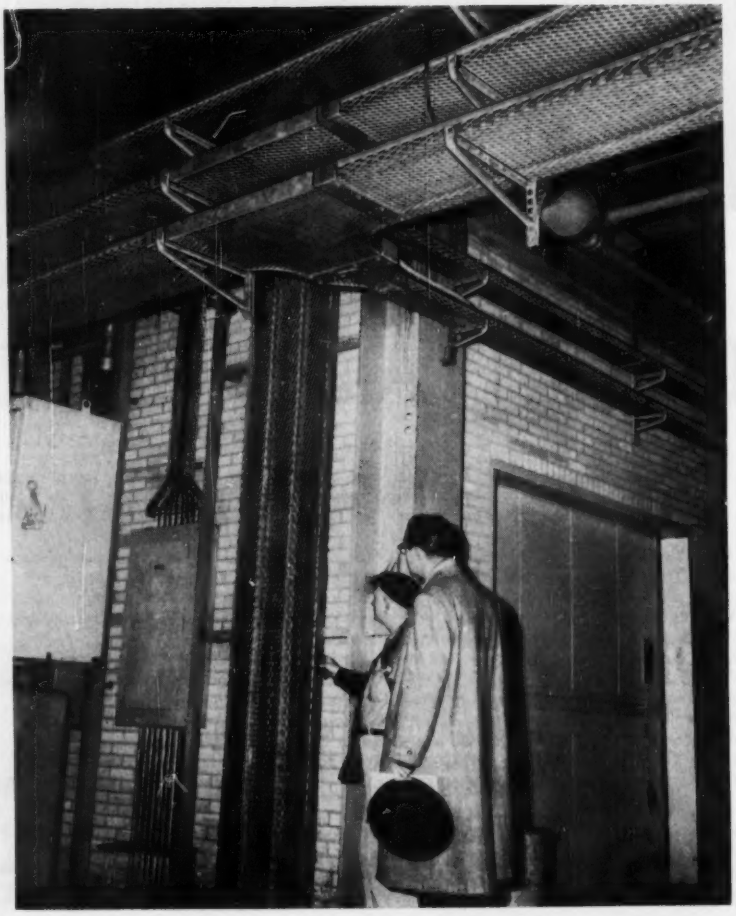
Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

Trays Reduce Control, Power Cable Costs

JOHN E. CASEY, Superintendent, Edwin H. Werner Station, Jersey Central Power & Light Co, South Amboy, N. J.

Expanded metal cable trough was selected for supporting control and power cables of the 1954 expansion to the Edwin H. Werner station of the Jersey Central Power & Light Co. Company engineers are convinced that their choice was a wise one for reasons of economy in installation and operating efficiency.





Conduit Originally Used

The metal trays were among innovations in an expansion program that added one new 62.5-Mw generator, and increased the capacity of the two existing 25-Mw generators to 27.5-Mw each. The old system generated 55 Mw; the new one generates 62.5 Mw. Originally, conduit supported all cables, as no other support was considered at that time.

Time and materials are important considerations when station renovation involves more than 100 miles of cable to be supported over a distance of two miles. The company installed about 15,000 ft of expanded metal cable trough in the new addition, using different widths and lengths and numerous fittings. The biggest single cost-saving factor, it found, was the time saved during installation. A single connection of cable trough was made in 10 to 20 min with the type of connectors used, consisting of nuts, bolts, and washers.

Connected on Floor

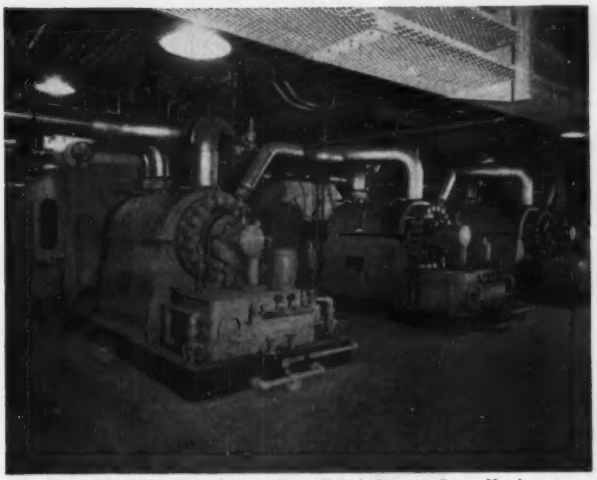
This type of connection was used although there is now a trough design embodying a pin which is driven between two interlocking barrels. This new design affords even faster connections.

Time was saved by loading control cables into a trough without regard to loss in current ratings. Installation was simplified by connecting several lengths of trough on the floor and lifting them into place simultaneously.

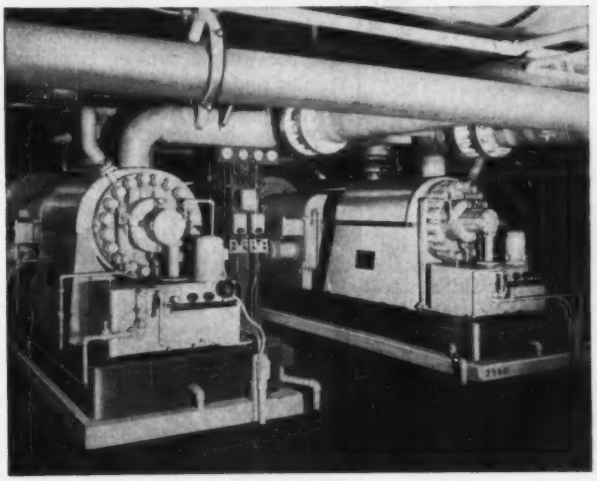
(*Continued on page* 100)

Keeping up with the Kilowatts

PACIFIC BOILER FEED PUMPS FOR ELECTRIC UTILITY SERVICE



▲ Two Typical Pacific Boiler Feed Pump Installations ▼



ADDED SINCE 1950 BY:

ALABAMA POWER *Company*
ATLANTIC CITY ELECTRIC *Company*
CALIFORNIA ELECTRIC POWER *Company*
CENTRAL ILLINOIS ELECTRIC & GAS *Company*
CENTRAL ILLINOIS PUBLIC SERVICE *Company*
CINCINNATI GAS & ELECTRIC *Company*
COLUMBUS & SOUTHERN OHIO ELECTRIC *Company*
COMMONWEALTH EDISON *Company*
CONNECTICUT LIGHT & POWER *Company*
DALLAS POWER & LIGHT *Company*
FLORIDA POWER *Corporation*
KANSAS GAS & ELECTRIC *Company*
LONG ISLAND LIGHTING *Company*
MISSISSIPPI POWER *Company*
NIAGARA MOHAWK POWER *Corporation*
OHIO EDISON *Company*
OKLAHOMA GAS & ELECTRIC *Company*
PENNSYLVANIA ELECTRIC *Company*
PUBLIC SERVICE *Company of New Hampshire*
PUBLIC SERVICE *Company of Oklahoma*
ROCKLAND LIGHT & POWER *Company*
SAN DIEGO GAS & ELECTRIC *Company*
SOUTHERN CALIFORNIA EDISON *Company*
SOUTHWESTERN GAS & ELECTRIC *Company*
TEXAS ELECTRIC SERVICE *Company*
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UTAH POWER & LIGHT *Company*

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Fast to make fast!

Safe, swift cable connections with

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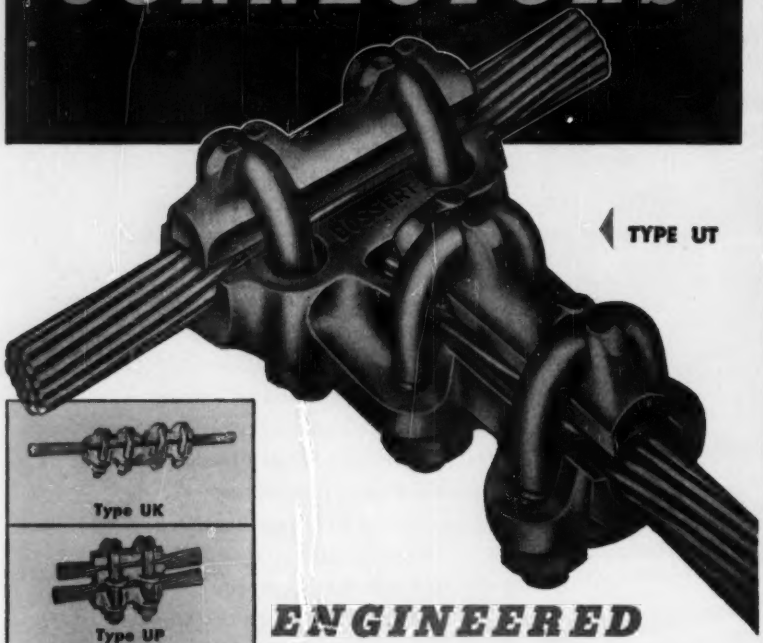
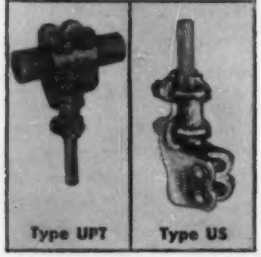
U-BOLT

CONNECTORS





ENGINEERED FEATURES:

VARIABILITY
Fits many cable sizes, reduces number of connectors needed for given number of combinations of conductors.

HIGH CLAMPING ACTION
U-Bolts clear all conductors by close limits, supported by saddles through their full arcs. Minimizes bending action, makes U-Bolts subject to tensile stress only.

CABLE END RELIEF
Allows for distortion in free ends of strands, ample room for binding end of stranded cable if desired.

CONDUCTIVITY
High copper alloy with sufficient contact area to insure cooler-than-conductor operation under maximum load.

Available for aluminum or aluminum to copper conductors.
Excl. Canadian Distributor: W. S. Gerrie & Assoc. Ltd.
4158 Dundas St. West, Toronto 18, Ontario

50 YEARS OF TECHNICAL KNOW-HOW

WRITE FOR DETAILS AND PRICES TODAY!

DOSSERT MFG. CORP.

249 Huron Street, Brooklyn 22, N. Y.

Trough Cuts Cable Cost

(*Continued from page* 98)

These procedures, along with the lightness of the trays, permitted a halving of installation time costs. The company has estimated that it saved approximately 250 tons of steel.

JCP&L engineers said that cantilever-type supports are simplier to use than the trapeze type, as the cable can be laid over the edge of the trough instead of being pulled through between the uprights. The Rakit trough supporting system was chosen because it gives a rigidity and strength more than necessary for supporting cable even over long spans.

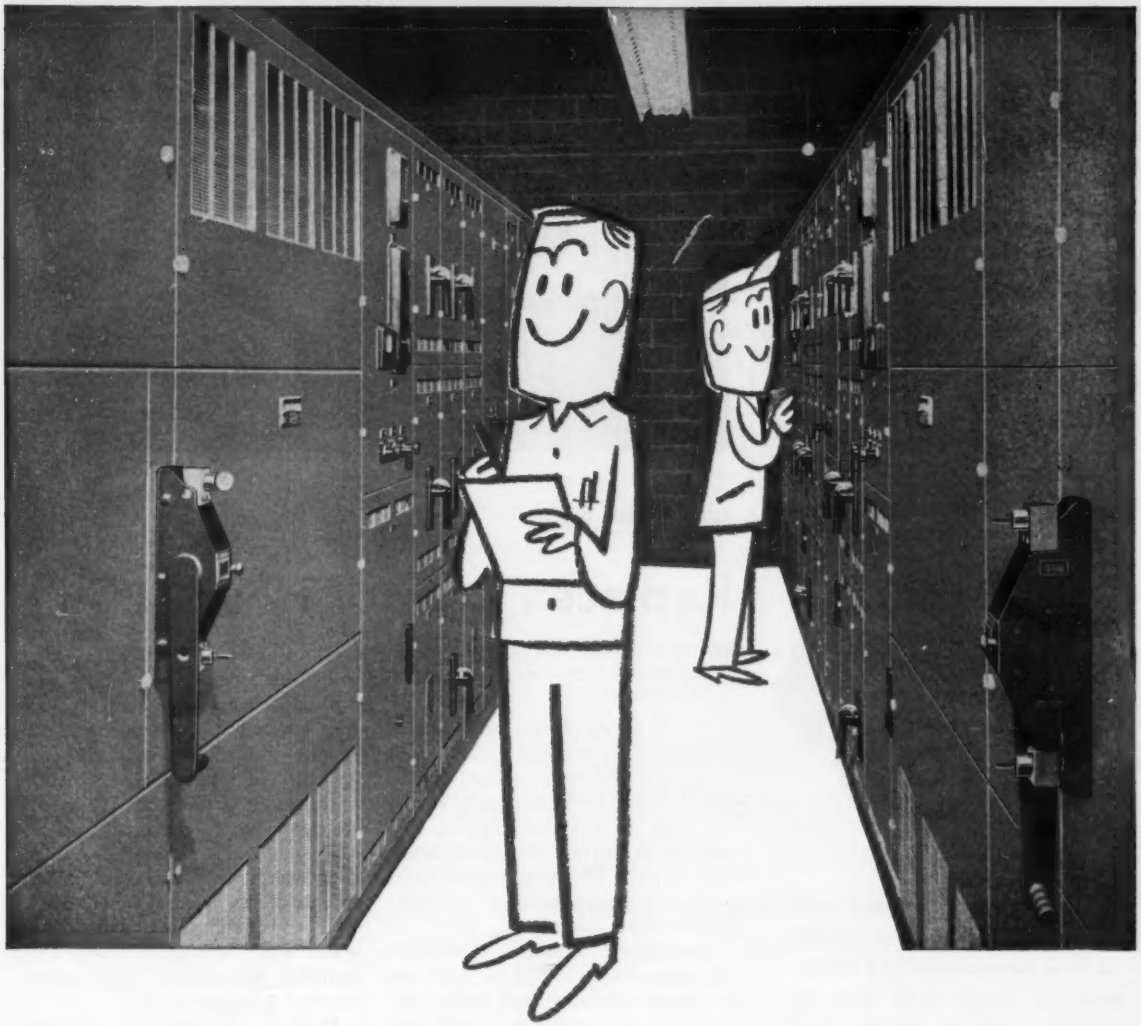
Any steam-generating station expansion program encounters space problems which become particularly acute during construction. At Werner station not only was confusion reduced during installation, but the trough permitted a number of cables to be delivered at the same point at a control panel or a distribution center. Turns, dropouts, and side runs were readily accommodated. Moreover flexibility of arrangement and the space saved contributed to the neat appearance of the finished job.

As the troughs support power as well as control cables, JCP&L engineers were concerned with the electrical characteristics of the troughs. The installation now convinces them that the troughs provide continuous metallic contact which, when grounded at intervals, provides a system not only safe but virtually certain to activate circuit breakers for a fault.

A trough system minimizes the use of steel in furnishing support for cables; and there is a direct relation between the use of steel and the inductive loss with an ac circuit. Although heat is generated in the cable, it is quickly dissipated by the circulation of air through and around the expanded metal trough. Reduced inductive loss and efficient heat dissipation contribute longer life to the insulation and substantially higher current capacity.

Even conservatively, a single layer of cable in expanded metal trough can be allowed a free-air rating. It is probably safe to allow free-air ratings even for two layers of power cable. The inductive losses to the trough are reduced by the much less permeable material surrounding the cable.

(*More How To on page* 102)



Bring dependable electric power nearer to where you use it —install an **I-T-E** Secondary Unit Substation in your plant

I-T-E Secondary Unit Substations make electric power more dependable, more economical. They bring higher voltages nearer the load, reduce power losses. They increase machine efficiency, reduce voltage drops inherent in long low-voltage runs. They save space—all necessary components are housed in one functionally designed unit. They protect plant personnel—all live parts are isolated and metal enclosed.

In addition, you save in delivery and installation time. All I-T-E Secondary Unit Substations are assembled, tested and shipped ready to install from one source of supply. And they are available for any application, indoor or outdoor, in any standard rating.

For complete information, contact your nearest I-T-E sales office. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY
Switchgear Division

The Old Reliable

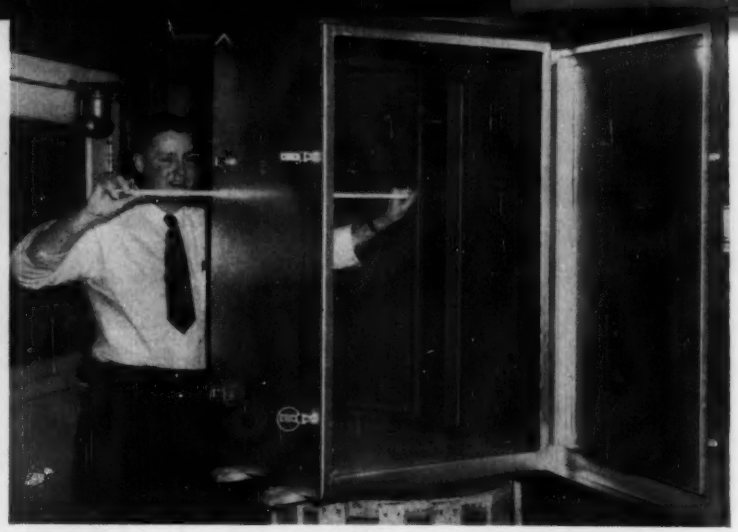
EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
FAIRFIELD, IOWA



SUBSTATIONS—Design

Replaces Control House

KENNETH HOWERTON, Senior Draftsman, Engineering Department, Idaho Power Co Boise, Idaho

Simplicity of design and ease of fabrication are cost-saving features of a weatherproof relay cabinet used by Idaho Power Co. Sixteen such cabinets are used at irrigation-pumping substations to replace the conventional relay house. The steel cabinet costs $140 ready for installation; a cabinet of aluminum costs $167.

The cabinets house protective relays for substation oil circuit breakers and mount on the breaker steel framework. Each cabinet is made of 12-gage steel and measures 44 in. high, 26 in. wide, and 23 in. deep. The doors on either end are made with a 1½-in. overlap to the side panels.

Inside each door is a 1x1-in. angle iron welded to the door to provide rigidity and a further weather seal. Around the top of the cabinet is a rain shield, which extends 1½ in. over the doors and 4 in. along the sides.

All joints in the cabinet are welded to provide the weather seal. Full-size models of the cabinets were made of steel and ⅛-in. aluminum to find which would be cheaper. Total costs, including material and labor, were in favor of the steel by $27.

Cabinets are fabricated in Idaho Power's own shop. At least 27 will be built for this season.

GENERATION—Maintenance

Soot-Lance Cleaner Proves Real Saver

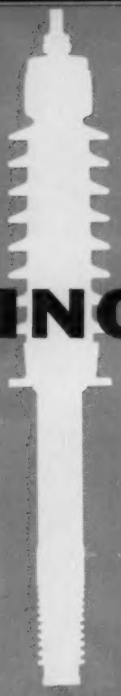
B. DALE WILLIAMS, T. J. HARDING, Maintenance Department, Muskingum Plant, Ohio Power Co, Beverly, Ohio

A special scraping device has reduced the time for cleaning iron-oxide deposits from IK soot-blower lance tubes from 10 man-hours to 2½ min per tube, the time it takes the soot blower to make a complete cycle. The device was made from a flat bastard file brazed to a flat steel handle which is held like a shovel while the soot blower is retracting its lance.

When the iron-oxide crust is fairly thick, it may need wetting to soften the deposit before the soot blower is run through its cycle.

Soot-blower lance tubes must be cleaned of iron-oxide deposits nearly every two weeks at Muskingum plant. Formerly it took two men, using a file, wire brush, and emery cloth about 5 hr for each tube.

A commercial lance-cleaning device costing about $40 is available, but one must be installed at every soot-blower location. The scraping tool used on all soot-blower lances at Muskingum plant was made in 1 hr from scrap.

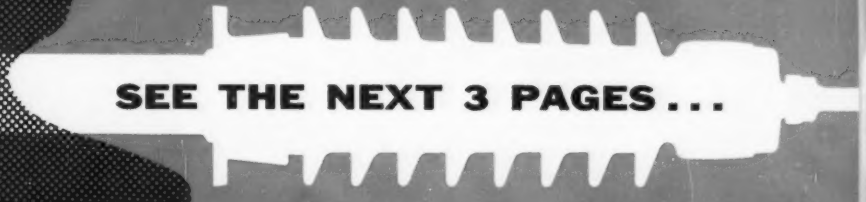


A NEW STANDARD BUSHING NOW COMPLETES THE 69-KV STATION PICTURE

. . . TODAY—YOU HAVE THE CHOICE OF TWO BASIC BUSHING TYPES AND THE WIDEST VARIETY OF LIGHTNING ARRESTERS AVAILABLE FROM O-B—ALL MEETING INDUSTRY STANDARDS — TO FILL EVERY 69-KV REQUIREMENT.

Ohio Brass

MANSFIELD OHIO, U. S. A.



SEE THE NEXT 3 PAGES . . .

now just ask for the 69-kv bushing you want... and you can have

THE BEST OF

from Ohio Brass

New GK-30 Model Announced — Conforming to ASA Standards — Featuring Fully Oil-Surrounded and Oil-Impregnated Insulated Core

"Give us a completely oil-filled bushing for 69 kv, meeting ASA Standards."

This insistent request has been made, repeatedly, by many apparatus users. Bushing builders have tried for it, but it's a big order! An adequate insulating core, space for oil circulation, and an outer porcelain housing—all within the standard restriction of 5¼-inch lower end diameter—has been a difficult challenge.

O-B now announces that this bushing has been devised, thoroughly tested, and is presently in regular production—first in the industry to reach this commercially complete state.

Today, you have free choice of bushing design at 69 kv. There is the LK-30 type using polymerized resin-paper core construction, and the new GK-30 type using oil-impregnated paper, with the core fully oil-immersed. Both types are supplied for either transformers or circuit breakers. Every one meets or exceeds ASA Standards. All are regular production items. All are fully interchangeable.

Ask your apparatus builder for the bushing you want, *and you can have the best of its kind from O-B!*

O-B TYPE GK-30 BUSHINGS ASA-NEMA STANDARD

	CATALOG No.	APPARATUS OIL LEVEL
Draw Lead — 400 Amperes	45413	16½"
	45414	21"
	45415	27"
Fixed Conductor — 1200 Amperes	*45428	16½"
	45429	21"
	45430	27"

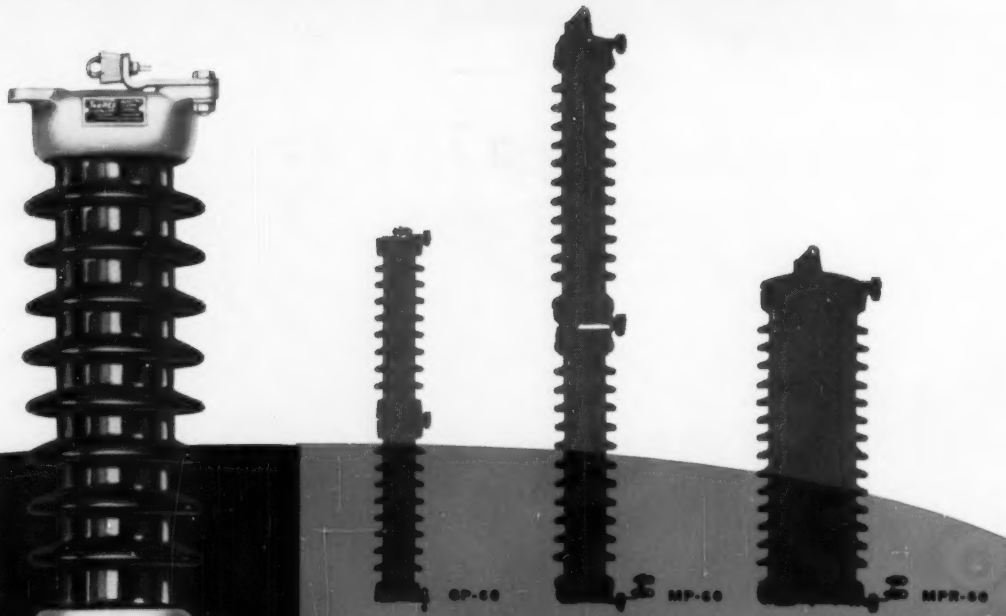
* ASA STANDARD CIRCUIT BREAKER BUSHING.

O-B TYPE LK-30 BUSHINGS ASA-NEMA STANDARD

	CATALOG No.	APPARATUS OIL LEVEL
Draw Lead — 400 Amperes	45125	16½"
	45126	21"
	45127	27"
Fixed Conductor — 1200 Amperes	*45152	16½"
	45153	21"
	45154	27"

* ASA STANDARD CIRCUIT BREAKER BUSHING.

LK-30, ASA Standard Bushing
Featuring: (1) Polymerized resin-paper, oil-resistant insulating core. (2) Oil immersion of core only above flange. (3) Exposure of core below apparatus oil level. (4) Multiple varnish coats on exposed core for protection in transit and in service.
ITS KIND
GK-30, ASA Standard Bushing
Featuring: (1) Oil-impregnated insulating core. (2) Lower end porcelain housing, providing end-to-end encasement of core. (3) Entire core immersed in circulating oil. (4) Magnetic oil level gauge on expansion reservoir.
NEW
Ohio Brass
MANSFIELD OHIO, U. S. A.



TAKE YOUR PICK AT 69 KV

A Complete Line of Thorex Lightning Arresters of this Rating Meets Any Combination of Requirements

Storm frequency, apparatus insulation level, importance of load, budgets—all enter into selection of your lightning arresters. There is an O-B Thorex arrester that will fit.

For the average operating conditions, pick the Thorex GP. It's the lowest-priced of the line, yet it is materially better than any arrester on the American market just five years ago. It is adequate for most jobs.

For more critical protection, or where older apparatus may be involved, there is the Thorex MP with 10 to 15 per cent lower IR discharge rating.

Maximum protective performance and immunity from effects of surface contamination are found in the Thorex MPR.

All of these O-B arresters, in 60-kv line-to-ground rating, are applicable to 69-kv systems. All meet or exceed standards for maximum-duty lightning arresters.

You have complete choice for 69-kv station construction among Thorex arresters. And, whatever that choice may be, you will be getting the best and most complete protection per dollar of installed cost. Add "O-B Thorex" to your 69-kv station specifications.

Ohio Brass

MANSFIELD OHIO, U. S. A.

4643-H

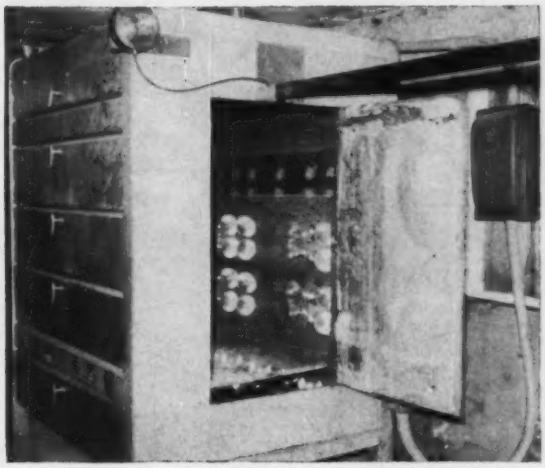
Infrared Oven Cuts Curing Time 75%

J. H. **TARBELL,** Industrial Engineer, Kansas City Power & Light Co, Kansas City, Mo.

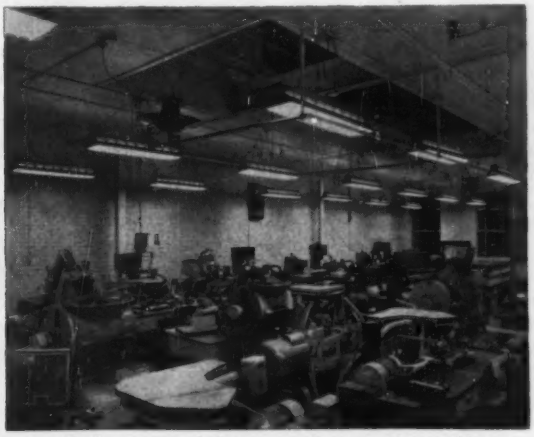
Curing sheets of porous cardboard material is now done with a 40-kw infrared oven at the Northeast Tool & Die Works in Kansas City, Mo. This firm manufactures hot patch kits for repairing tires. They were having difficulty curing the sheets of cardboard material which, in the process, are dipped in a nitrocellulose solution, cured, and cut to size. When ignited, the nitrocellulose impregnation generates the heat for vulcanizing the patch.

An indirect, gas-fired, convection oven had been used for curing the impregnated cardboard sheets. The author suggested that the difficulties being experienced with the gas system could be eliminated by using infrared equipment. The infrared oven which was installed reduced curing time from four hours to one.

Northeast Tool & Die Works also replaced a gas-fired dipping tank used in the process with 31 kw of immersion type heaters. These, with thermostatic controls, maintain the required temperature.



40-KW INFRARED OVEN REDUCES CURING TIME for sheets of impregnated porous cardboard from four hours to one



THIS CIGAR MANUFACTURING shop raised output by modernizing with fluorescent lighting, semi-automatic machines

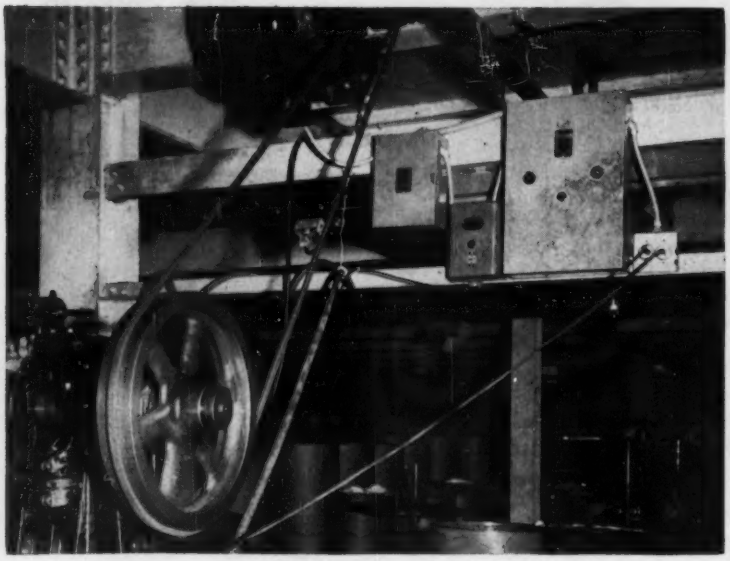
Upgraded Lighting Helps Increase Cigar Output

J. M. **GENSBURGER,** Industrial Representative, General Sales Dept, New Orleans Public Service Inc., New Orleans, La.

Quality lighting of a sufficient level was considered a "must" when M. Trelles & Co decided to manufacture cigars semi-automatically instead of manually to meet the growing demand.

A power company representative provided Trelles with a custom-tailored lighting plan which called for louvered semi-direct fluorescents using two 40-w, T-12, standard cool, 425-ma rapid-start lamps. Fixtures were to be 9 ft above the floor, installed in four rows of seven fixtures each. This would minimize shadows and yield a maintained intensity of 27 ft-c. Louvers on the bottoms of the fixtures help shield direct glare of the lamps.

This plan has been accepted and installed. As a result, employees are less tired at the end of the day because they have been able to see easily while working. New lighting load: 2.6 kw. A mixture of fluorescent and incandescent light, the old lighting load was about 1.2 kw, which produced about 10 ft-c at the work level.



Overload Monitor Cuts Tool Losses

R. HEGEL, Industrial Sales Engineer, Connecticut Light & Power Co, Waterbury, Conn.

The use of the Sperry Protectron electronic overload protector has markedly reduced tool and die breakage in the operation of punch presses at the Waterbury Buckle Co, Waterbury, Conn., reports E. B. Powell, plant manager.

This electronic device continuously monitors the power drawn by a machine driven by an electric motor. Such power is proportional to the mechanical work load on the machine, with the Protectron warning and then tripping when the load increases above a preset value of mechanical overload. When the Protectron trips, a red warning light is illuminated, and a relay is energized to initiate any desired control function. This device is instantaneous in action, sensitive to minute overload, and continuously adjustable to any value of normal load and degree of overload.

Major benefit from the installation of Protectron units has been the reduction of costly tool damage. This reduction in a short period more than paid for the installation. Moreover, workers in the metal stamping room are freed from constantly watching the machines for jamming, etc., with consequent greater ease of operation. One man can now operate several machines safely.

Distillation Improved by Accurate Electric Heat Control

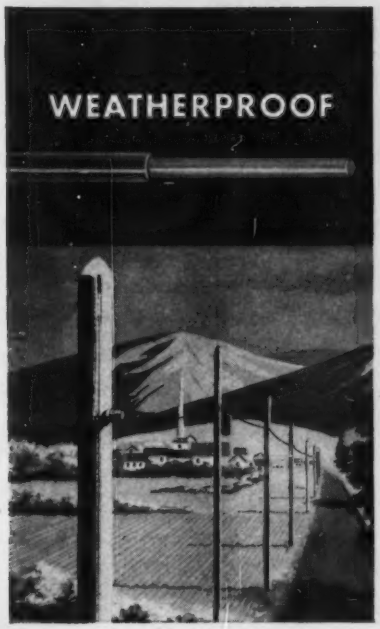
ERNEST L. HUSE, Division Sales Manager, Jersey Central Power & Light Co, Asbury Park, N. J.

Distillation and fractionating processes are made easier to handle by 105 kw in electric heat which warms a solution circulating around a 1,000-gal kettle. Operating at 220 v, heaters raise this kettle's contents to 245C. Originally installed to enable Norda Essential Oil & Chemical Co, Boonton, N. J., to purify sodium, the kettle is now used 75% of the time for other jobs. This is because of its proved versatility and the ease with which it is used. Company officials feel that electric heat provides an exceptionally smooth control of temperature, a highly valued virtue for distillation and fractionating processes.

Uniform moisture content in batches of concrete is now assured at the Stocker Sand & Gravel Co's concrete block plant at Gnaddenhutten, Ohio. Variations in moisture content have long been a production problem. Two electrodes in the mixer bowl feed mixture information to an adjustable electronic control unit. This unit, in turn, automatically regulates the solenoid valves of the water supply to maintain the mixture at a constant moisture content. The same unit is also used to control mixtures in Stocker's transit-mix operation. The new installation has reduced waste and boosted production sufficiently to pay for the equipment in six months. R. D. Rine, Commercial Sales Representative, Ohio Power Co, Dennison, Ohio.

Steel containers in sizes from 8 to 12 gal are being turned out at the rate of 600 an hour by the Virginia Barrel Co of Baltimore. To save paint, thinner, time, and labor, a 1.25-kw paint heater was installed. This unit maintains 160F so that viscosity is always the same and results are uniform. No thinner is added to paint because the heated paint has the correct consistency. Overspray losses are reduced, and one coat covers because of the heavier body. By Ralph C. Young, Industrial Power Department, Baltimore Gas & Electric Co, Baltimore, Md.

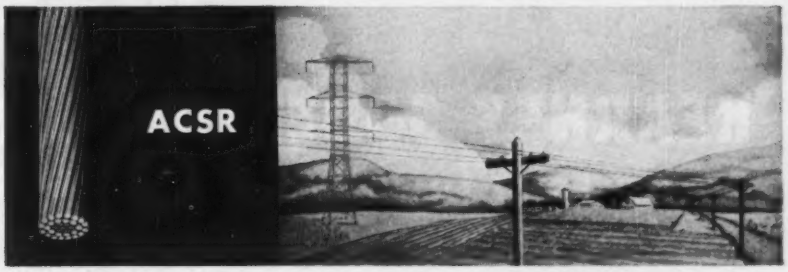
Electrically refrigerated, bulk milk dispensers have cut labor costs and storage requirements in the snack bars of two high schools. The fixtures, in the Redwood and Mt Whitney High Schools at Visalia, Calif., hold two 5-gal cans and are used to dispense milk for individual drinks and milkshakes. The delivery man places the cans in the dispenser and connects a sterile tube from the can to the spigot. The milk is then ready to be drawn. When the can is empty, the delivery man replaces it with a full one and inserts a fresh sterile tube. No storage space is required and handling by school employees is completely eliminated. The savings can be passed on to the students. John R. Parker, Industrial Power Engineer, Southern California Edison Co, Los Angeles, Cal.



GENERAL CABLE

ALECTRAL

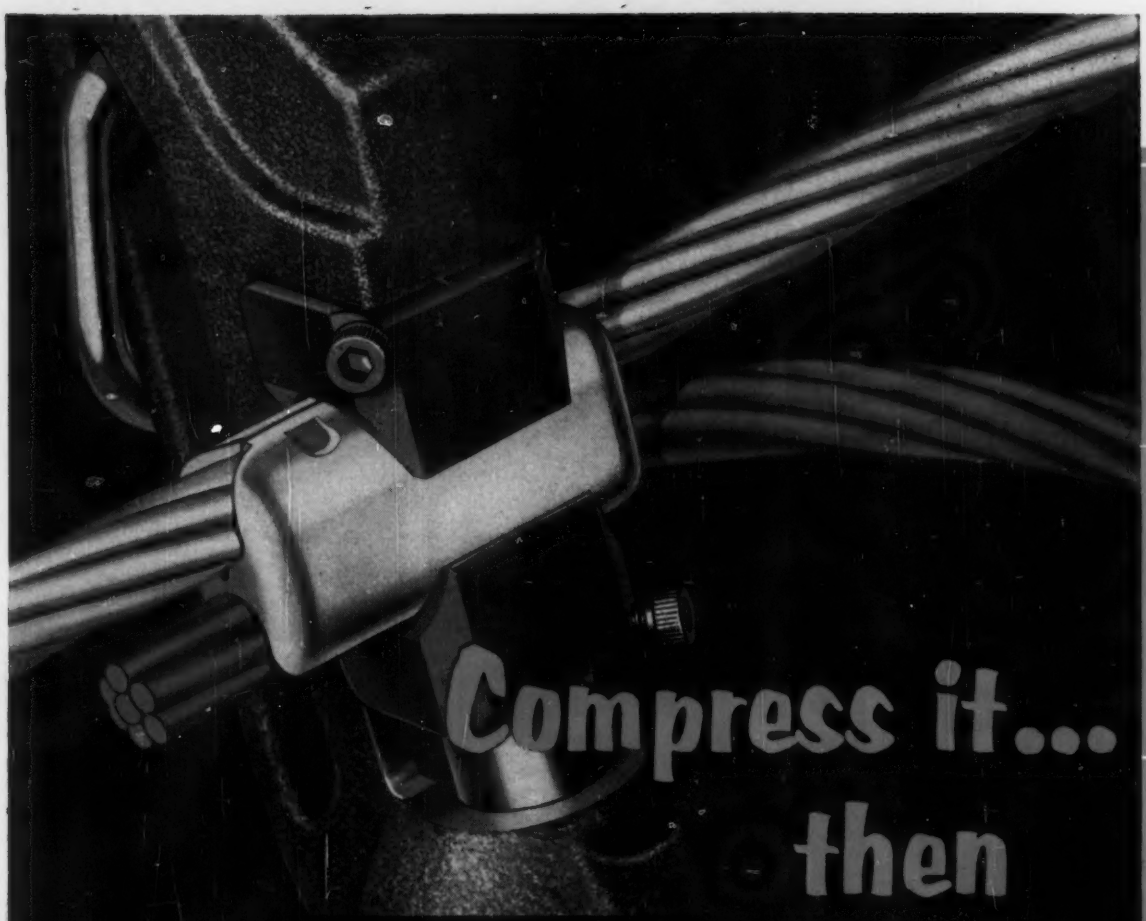
FOR ALL ALUMINUM CONDUCTOR REQUIREMENTS



Built into all ALECTRAL products are 75 years of General Cable's engineering and manufacturing experience. In this record are more than 25 years of successful performance of *insulated* aluminum conductors marketed as ALECTRAL. Available in ALL-ALUMINUM, ACSR, WEATHERPROOF and with RUBBER and THERMOPLASTIC insulations. A sound and economical investment for all voltage ranges.

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.
Offices and Distribution Centers Coast-to-Coast

For quality and service...SPECIFY GENERAL CABLE



Compress it... then forget it!

KEARNEY SQUEEZON CONNECTORS

Assure Long-Lasting, High-Conductivity Joints

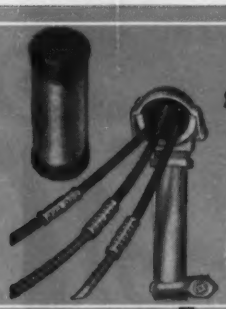
This SQUEEZON makes tight contact with about *100% more conductor surface.* Notice how each conductor fits into its own groove . . . how it is gripped around its entire circumference. Not only does this assure maximum conductivity . . . it also prevents any possibility of strand-cutting.

The metal between the two grooves forms KEARNEY'S famous "built-in spacer." It provides a metallic barrier necessary to prevent and withstand electrolytic action.

Trouble is prevented before it can start. Here is a compression connector that really "connects 'em for keeps!"

JAMES R. KEARNEY CORPORATION · 4224-42 CLAYTON AVE., ST. LOUIS 10, MO. · *Canadian Plant:* GUELPH, ONTARIO

Types to meet every construction need:



SERV-ENS

...service entrance sleeves for fast, neat and dependable service loop connections...for all combinations of ACSR, aluminum and copper conductors.

T-TAPS

...heavy walled with extended contact areas to make stable connections under all load conditions for any combination of ACSR or aluminum and copper in sizes from 1/0 to 400 Mcm. Only two die sizes are required to install the complete range of sizes of T-Taps.

TERMINAL ADAPTERS

...eliminate problems in connecting aluminum conductors to bronze or copper terminals of equipment. The aluminum sleeve is factory bonded to a length of soft copper wire...plastic covered for greater protection.

DEAD ENDS

...standard aluminum or copper Squeezon connectors make excellent high strength, low cost dead ends at either the pole or house end of secondary lines and service drops. They are easy to install and make a much neater appearing job than other methods. Depending on the holding strength desired, from one to three Squeezons may be used. Three Squeezons in series will, in general, develop the full rated strength of copper or ACSR.

L-TAPS

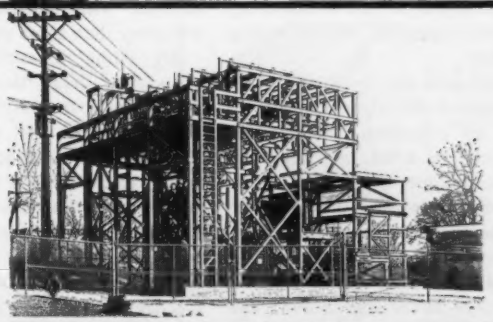
...recommended for safely connecting copper to aluminum—either line side or tap side—in locations where atmospheric contaminants will physically bridge the spacers of Squeezon connectors. The long heavy walled run section securely grips the line wire. The bore for the tap wire contains Kearnalene and is capped.

GROUND ROD SQUEEZONS

...improve circuit safety by eliminating open grounds and ground wire burn-offs caused by loose clamps. Squeezons have no screws or bolts to loosen. The dies form the fitting so that there is constant pressure on wire and rod, placing all transfer surfaces in permanent low resistance contact—safe for buried installations. The fittings are made of pure copper for highest conductivity, and forged for maximum strength.

CONNECTORS FIELD TESTED

Here at KEARNEY'S Substation Laboratory of 150,000 KVA Transformer Capacity—with a back up power of 445,000 KVA all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are actual, proved performance ratings...not just theoretical calculations. You can be sure they will do the job they are supposed to do...with a generous margin of safety!



JRK-312R

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify

JAMES R. KEARNEY

The Mark of Quality

KEARNEY PRODUCTS

Problem:

How to Cut High Heating Bill Complaints

Solution:

I&M Stresses Better Insulation

"If there's one thing that can wreck a utility's electric heating program its high bill complaints. And nearly everytime a gripe comes along I can lay it to one of two things: The house isn't insulated well enough. That, or it doesn't have the proper thermostat controls."

This is a utilityman in the Far West talking. And his statement seems to echo experiences of just about every other power supplier who is selling electric heat.

To overcome the insulation problem, Indiana & Michigan Electric Co has put an education program for local insulating firms into play. So far the technique appears to work. A check this year showed 96% of its electric heating customers were completely satisfied with their heating jobs. And I&M has a sizable number: A total 1,726 at the end of 1955 and another 1,000 which is expected to be added this year.

The company sponsored a meeting recently to foster a better understanding of proper electric house heating insulation standards. Attending were 25 sales representatives and factory engineers representing 15 of the major insulation companies doing business in the I&M area. I&M described its own promotion efforts, released its sales figures, and showed the slide film, "Heat Better Electrically", newly produced by the National Electrical Manufacturers Association.

The insulation people were told that their product, adequately and properly installed, is a prime reason why 96% of I&M's customers are satisfied with electric heating. The company then came up with its proof.

By citing a sample home, the group was shown that with 4 in. of insulation in the ceiling only, annual electric heating cost would be $305. Customer dissatisfaction naturally would result. With 2 in. of insulation in the wall, four in the ceiling and two in the floor, the operating cost would be $195—high enough to make the customer doubt the economy of electric heat. But the same home with 3⅝ in. of insulation in the walls, 6 in. in the ceiling, and 3⅝ in. or aluminum foil in the floor, would cost only $160 to heat. Such a home would insure complete satisfaction on the part of the customer.

Translating the insulation standards in the well-insulated home into "U" factors (applicable to any insulation), the meeting was told that the satisfied heating customer would require these factors:

Wall	.06	(3 in. with a K factor of 0.27)
Ceiling	.045	(6 in. with a K factor of 0.27)
Floor	.06 to .08	(Aluminum with 3 in. of air space or 3 in. with a K factor of 0.27)
Windows	.61	(Double glass)
Slab Floors		45 Btu per lineal foot (2-in. perimeter)

These standards are slightly higher than those recommended by NEMA.

Slide films were shown of six homes in the I&M area, all of them well insulated and with extremely low operating cost records. Photos of actual sevice bills were displayed.

An hour-long discussion period following brought a barrage of questions. Most of them dealt with the various characteristics of insulation vapor barriers, and insulation requirements. The meeting was assured that any type insulation is acceptable if actual tests show it to have the desired "U" factor.

Representatives of the insulation manufacturers agreed that the suggested standards were fair. I&M has plans to publish them soon in handbook form.

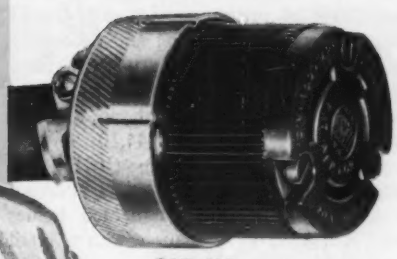
Cuts wiring time 1/3!

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

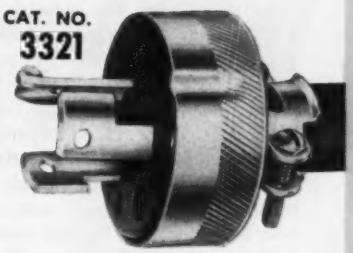
NEW, SUPER

Twist-Lock®

SERIES 3000



CAT. NO. 3323

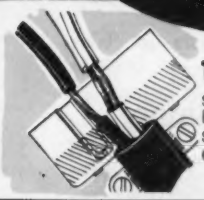


CAT. NO. 3321

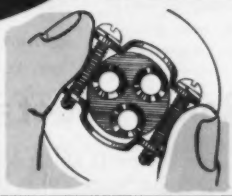
ONE out of every *THREE* valuable wiring seconds *SAVED*, thanks to Hubbell's new screwless *PRESSURE-GRIP* terminals. This exclusive cost-saving and labor-saving idea completely eliminates the conventional "wrap around—screw down" binding post method. Wire ends are simply pressed into their individual pockets and are locked securely when the dead front section is positioned. Tests prove it's the safest, most secure, most foolproof connection there is. Remember, it *PAYS* to have *GOOD CONNECTIONS*. Hubbell connections, that is.

Write for folder

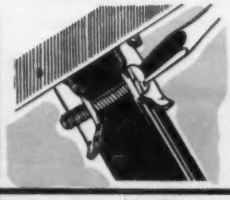
Completely Wired in 6 easy steps



1. Use knurled section on shell as strip gage. Insulation left on wire ends can simplify insertion by containing strands.



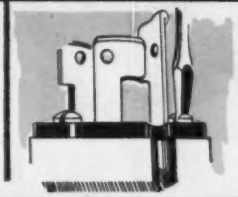
2. Spread cord clamps and insert conductors into holes making sure green (ground) conductor enters hole marked GR.



3. With cord pressed in firmly, tighten cord clamps to maintain position.

4. Judge approximate wire length and snip off excess.

5. Bend each conductor outward into its individual pocket and press firmly into place.



6. Insert dead front into keyed shell and engage the two sections securely by tightening each screw alternately until all are firmly seated.

Harvey Hubbell, INC.

DEPT. E-2

BRIDGEPORT, CONNECTICUT

Bridgeport 2, Connecticut
State and Bostwick Streets

Chicago 7, Illinois
37 South Sangamon Street

Los Angeles 13, California
103 North Santa Fe Avenue

San Francisco, California
1675 Hudson Avenue

Dallas 7, Texas
1111 Dragon Street

FACTORY WAREHOUSE LOCATIONS ASSURE NATIONWIDE STOCK AVAILABILITY

Fixture Sales Face Big "If"

Lighting unit sales could increase 5 times but first public must be helped and shown where and how to buy

Sales of residential lighting fixtures can be four to five times their present volume in the next five years—but to make these sales the industry must first cinch up its retailing methods and give the customer more help in buying.

This is the opinion voiced by H. L. Weiss, general manager of General Electric Co's Large Lamp Department, at a recent meeting of residential fixture distributors in Cleveland. The fixture business, he said, must anticipate and meet the lighting needs of American families by providing a source of supply backed up by service.

To James C. Forbes the biggest single problem facing the industry is in giving the consumer a place where he can buy lighting and be sure of getting what he needs. Forbes, who is manager of market development for GE's Large Lamp Department, pointed out that the average home has only one-fifth of the lighting it needs. He urged greater participation in his company's "Light for Living" campaign as a part of the electrical industry's Live Better . . . Electrically, Housepower, and Operation Home Improvement programs.

"The market for residential lighting fixtures is better than eight times the level of present sales," said Gladys Miller, merchandising and decorating consultant. She came up with these statistics: "There are 10.9 fixtures in the average home with an approximate retail value of $44.10. A well-lighted home of 1,200 sq ft requires 25 fixtures valued at retail at about $210. But the best lighted homes would have 35 fixtures with a retail value of about $360."

Miss Miller told the distributors that they must display their stock better and carry adequate stocks tailored to fit local selling conditions if they are to make greater fixture sales.

The matter of fixture "allowances" in new home construction brought a variety of viewpoints. One trade association executive said he would like to see an allowance of 3% of the home's total cost but would be "tickled to death" with 1 or 1¼%. Right now the allowance is generally around ½%. A Southern distributor had other ideas. "This fixture allowance stuff is all nuts," said he. "If you display your fixtures properly and sell 'em right, the customer will forget about the allowance and spend what he wants."

GE sees an even more lucrative market among existing homes. There are 46 million of them versus one million plus new ones each year. The problem: The owner of an existing home doesn't know where to buy lamps and fixtures. An answer: More advertising and promotion, smarter merchandising by distributors and retailers with the local utility on hand to take the lead.

Water System Sales Up But Big Market Still Exists

Sales of electric water systems hit 788,000 units last year—the highest on record, according to Carter Publications, Inc, research department. This leaves some 2-million farm homes without convenience of pressure water systems.

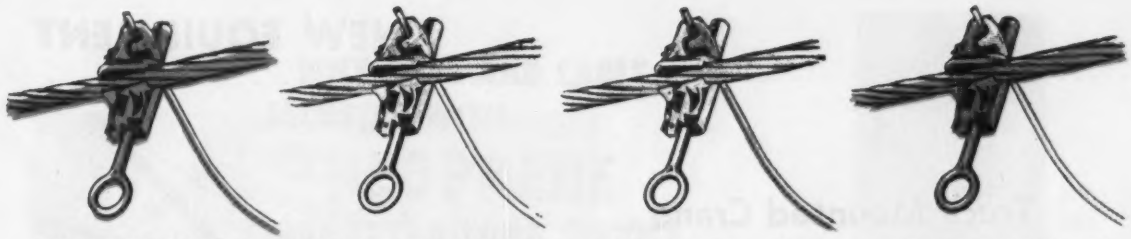
Potentially, the 2-million farmers make up a big market for other sales too. Informed observers estimate that for every $100 spent on water systems another $900 is spent for appliances and equipment dependent upon running water. About 6 million electric water systems have been sold in past ten years, the publishing firm said.

Rating Sheet = Wiring Savvy

The housewife at left doesn't quite fathom "watts," "amperes," and "volts." With the aid of a "Housepower Rating Sheet," though, her electrical contractor or utility representative provides at a glance what equipment can and cannot be connected to the existing wiring system. It will provide, too, a signed record of electrical facilities which can be connected immediately after wiring has been expanded.

Recently announced by National Adequate Wiring Bureau, the rating sheets come in two styles—one for existing homes, the other for new homes. With the first, a conventional wiring system survey guides the housewife on what equipment she can use now and what she can expand for in the future. The sheet becomes a concise record after work is completed for both customer and contractor.

(*More S&S on page* 154)



COPPER TO COPPER | ALUMINUM TO ALUMINUM | ALUMINUM TO COPPER | COPPER TO ALUMINUM

You can tap all 4 with these AGP* tap clamps

Chance AGP Clamps, approved by power company after power company on the basis of their own tests, can be used for all types of connections: copper to copper, copper to aluminum, aluminum to aluminum, and aluminum to copper.

Chance FORTIFIED cadmium coating, applied .001" thick to the aluminum body of the clamp, resists corrosion and electrolysis in all types of connections. This high density FORTIFIED cadmium coating gives extra long life protection to both the clamp and the conductor.

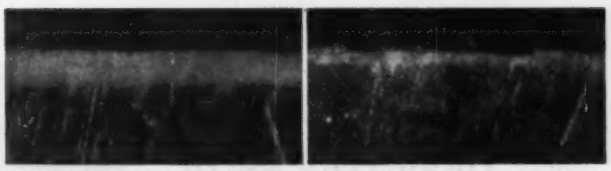
AGP tap clamps have the advantage of light weight which lengthens conductor life by minimizing the effects of vibration and makes them easy to handle on a clamp stick . . . plus easy identification with the RED EYE SCREW—plus their most important feature, their versatility. You can reduce your inventory and simplify your stocks by standardizing on AGP.

CHANCE PERMA-GRIP TAP CLAMPS

Here's a service-proved tap clamp for all general applications. Gripping jaws of this clamp make a three-point contact with conductor.

CHANCE "P. C." (PROTECTED CONNECTION) CLAMPS

Complete thread protection for easy installation and removal. No threads are ever exposed except in the extreme opened position. Wide jaws contact all strands.



Micro-photo above compares Chance A.G.P. fortified cadmium coating (left) to commercial plating, one reason for A.G.P.'s success.

*Aluminum General Purpose

ABC INDUSTRIES

CC56-4

A·B·CHANCE CO·

CENTRALIA, MISSOURI

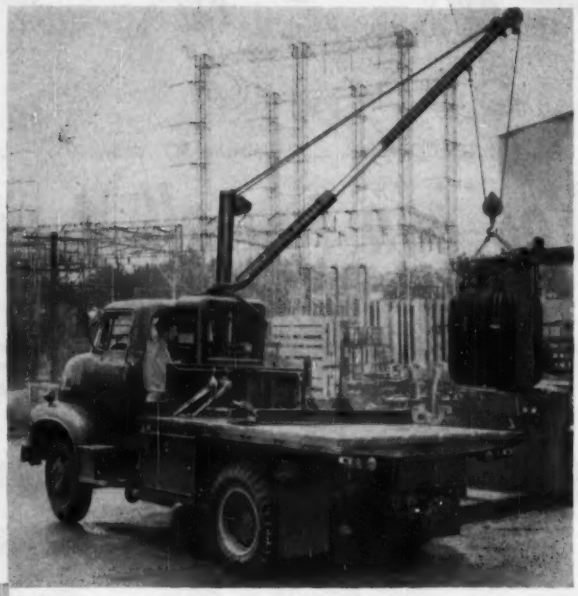
San Francisco, California • Pittsburgh, Pennsylvania

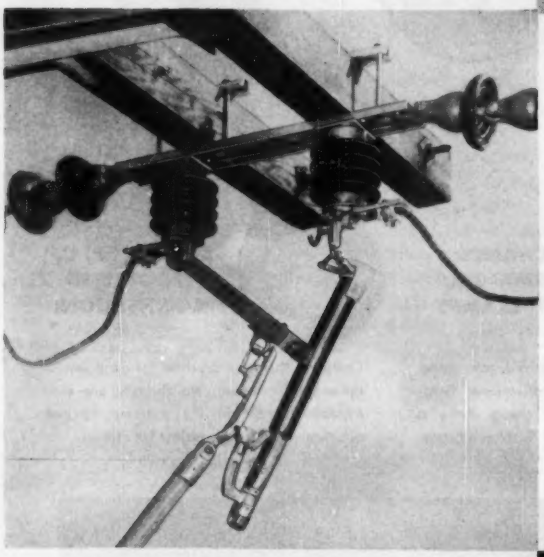
Truck Mounted Crane

A truck mounted hyraulic crane, designated "Load-Master", has a rated capacity of 4,000 lbs. Designed for installation on any chassis having a cab-to-axle dimension of at least 84 in., the unit is said to require only 20 in. of mounting space behind the truck cab.

All movement is hydraulically actuated. Power is derived from a hydraulic pump, driven by a power take-off on the truck transmission. It is operated by one man. The load will reportedly not drop even though the truck engine fails. A relief valve prevents overloading.

McCabe-Power Auto Body Co, St. Louis 15, Mo.





Loadbreak Tool

A portable loadbreak tool, known as "Loadbuster", can be carried conveniently on utility line trucks and applied to break all load currents to 400 amps. It reportedly provides arc-free interruption of any distribution system voltage through 14.4 kv.

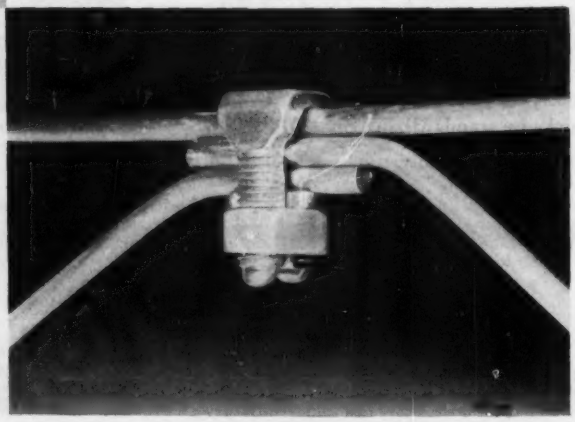
The tool, which can be used over and over, permits disconnects and cutouts on a system to be operated as load interrupter switches. Since no external arc is said to result with the tool, it provides increased safety for the lineman. Because its use is repetitive, manufacturer claims that costs are held to a minimum.

S & C Electric Co, Chicago 40, Ill.

Three-Wire Servit

Three-wire servits using split bolt connectors have been designed for No. 6, No. 4, and No. 2 solid copper. All have REA approval. They are forged, are reported to have closely dimensioned threading for easy starting and minimum frictional losses in tightening, and have flat-headed heads for good wrench gripping. High tightening torque is said to make for good connections. Reuseable.

Burndy Engineering Co, Norwalk, Conn.



(*More New Equipment on page* 118)

WHY WIRE AND CABLE JACKETED WITH NEOPRENE GIVE EXTRA-LONG SERVICE

NEOPRENE RESISTS WEATHERING — resists deterioration from exposure to sunlight, weather, and temperature extremes through long years of service.

NEOPRENE RESISTS OIL AND GREASE—and exposure to chemicals and solvents has little effect.

NEOPRENE IS RESILIENT—has excellent resistance to flex cracking, abrasion, chipping, cutting.

NEOPRENE PROTECTS AGAINST ELECTROLYTIC ATTACK—neoprene coverings protect lead sheaths from electrolytic action.

NEOPRENE WON'T SUPPORT COMBUSTION — provides maximum safety in danger areas where flame propagation is a serious hazard.

NEOPRENE RESISTS OZONE and **CORONA CUTTING** — neoprene resists both causes of deterioration equally well.

Neoprene's remarkable *balance of properties* is the big reason why it's the best jacketing material for wire and cable. Rugged neoprene jacketing gives maximum protection in conduits, above ground—even buried direct in earth. Neoprene has had over 20 years of successful field experience in all kinds of rubber products. You can count on long-term dependability when you specify wire and cable jacketed with neoprene. For full details get in touch with your wire and cable supplier.

NEOPRENE
The rubber made by Du Pont since 1932

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

MAIL THIS COUPON TODAY!

E. I. du Pont de Nemours & Co. (Inc.)
Elastomers Division, EW-10
Wilmington 98, Delaware

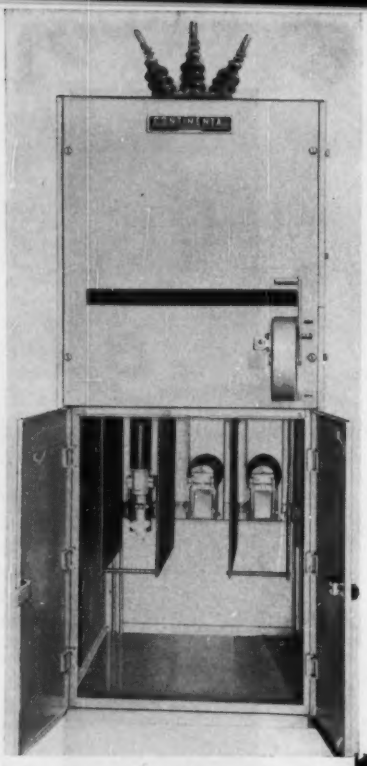
FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip coupon to get on the mailing list.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____



Air Interrupter Switch

This high voltage air interrupter switch functions as an air break disconnect with continuous and interrupting ratings to 600 amps at 15 kv. Designed to be opened safely under load, the switch will interrupt all currents to its continuous rating. Combined with power fuses, the switch reportedly offers full circuit protection where automatic restoration is not required.

Continental Electric Equipment Co, Cincinnati 2, Ohio.

Non-Magnetic Tester

An automatic inspection unit for non-magnetic rod, wire, tube and bar reportedly detects such problems as seams, overlapping, diameter changes, inclusions, voids, concentrated porosity, metallurgical variations and splits.

Called the Magnatest FW-400, the unit is designed for high speed operation on production lines or hand operation in laboratories, and will perform either the absolute or differential type of test. A vertical floor model, a console, and a table model are available.

Magnaflux Corp, Chicago 31, Ill.

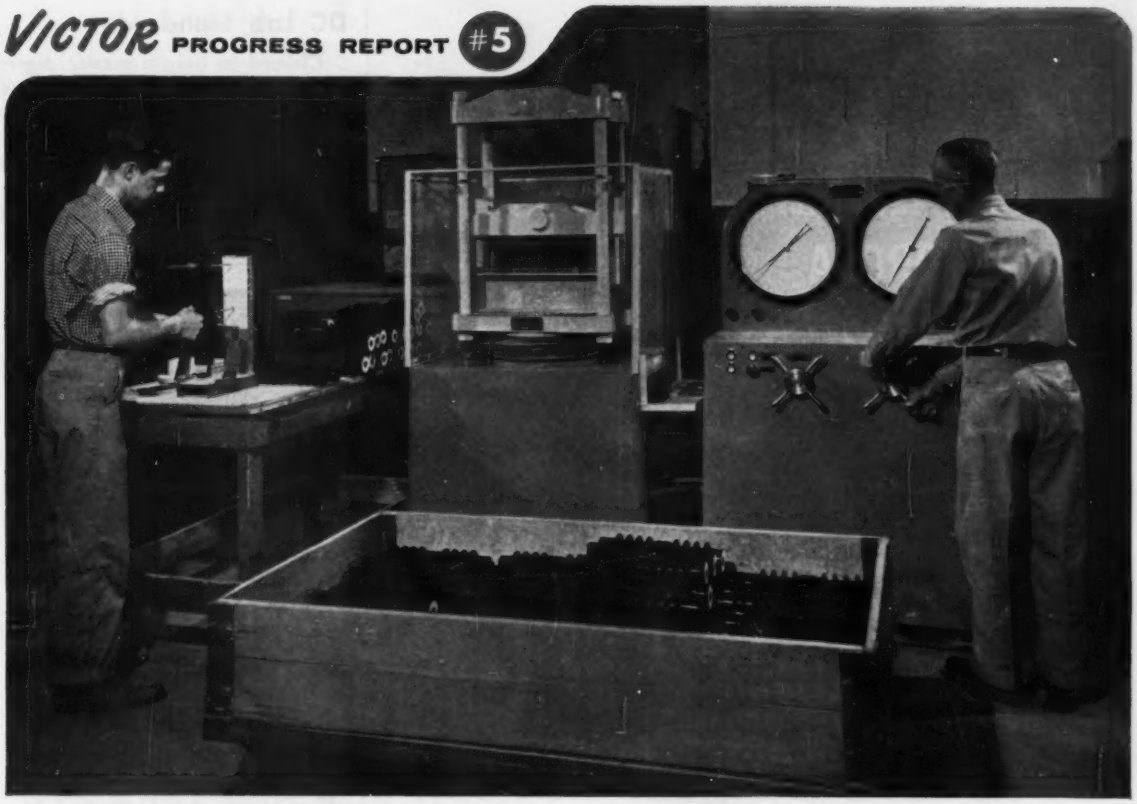
Motorized Toboggan

A motorized sled reportedly capable of towing loads up to 1,000 lbs from 5 to 25 mph, is said to be suitable for over-snow transport of line crews. Using a one cylinder, 8¼-hp air cooled engine, the Model K-12 sled is driven by an endless, cleated track which is spring loaded for shock protection. Two steering skis provide the vehicle with a 12-ft turning radius.

Four Wheel Drive Auto Co, Clintonville, Wis.

(*More New Equipment on page* 120)

VICTOR PROGRESS REPORT #5



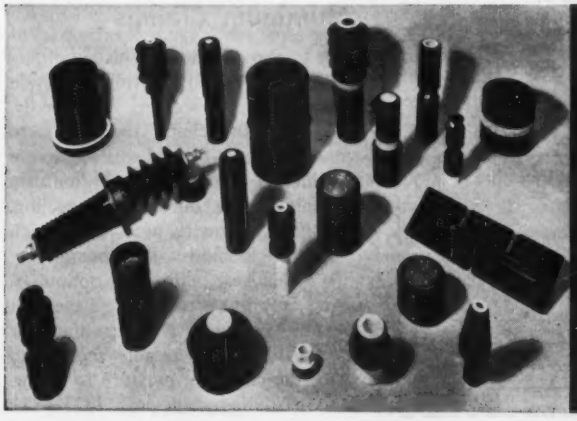
VICTOR

PURIFIED PORCELAIN

the Industry's standard for Special Shapes!

The hydraulic testing machine shown above is located in Victor's special porcelain testing department. Insulators such as these open cutouts are given a calculated transverse load before electrical test. The inspector on the left is checking hole alignment.

Starting with *Purified* Porcelain—finest insulator porcelain ever made—all special shapes made by VICTOR undergo rigid quality controls, tests and inspections to assure users of the best insulating materials money can buy. If you need special shapes required in cutouts, circuit breakers, potheads, capacitors, switchgear, transformers and other electrical equipment, choose the best! Choose VICTOR!



SPECIFY VICTOR

Purified Porcelain Insulators!

I-T-E

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

Insure LIKE NEW
2-way radio performance...with
MOTOROLA
Factory Approved
Replacement
Parts

FREE for the asking.
Motorola's new Parts Catalog

- 72 pages, over 6000 parts
- Part numbers, descriptions, and prices
- Cross indexed for easy reference

Here are replacement parts engineered, factory inspected and tested to new equipment standards; you get the same quality parts used in new equipment. Motorola's reputation as the leading manufacturer of two-way radio is your guarantee of dependability and long life. Prices are competitive—seldom higher, often lower than the prices of "garden-variety" parts. Conveniently located Parts Depots give you shipped-same-day-order-received service. Parts can also be ordered direct from Authorized Motorola Service Stations.

TUBES . . . VIBRATORS . . . CAPACITORS . . . FUSES . . . LAMPS . . . PANEL METERS . . . SELENIUM RECTIFIERS . . . RESISTORS . . . SPEAKERS . . . SWITCHES . . . and all electrical or mechanical replacement parts for mobile radio.

MOTOROLA
FACTORY APPROVED REPLACEMENT PARTS

Mail Coupon Today!

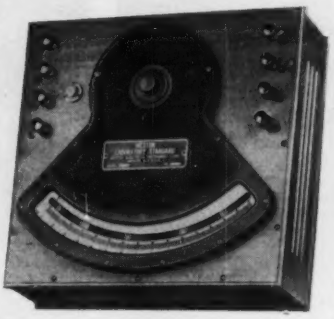
Motorola Communications & Electronics, Inc.
Factory Parts, Dept. EW
589 E. Illinois St., Chicago 11, Ill.

☐ Please send a copy of the new Motorola Communications Parts Catalog.
☐ Please send me the name and address of the closest Authorized Motorola Service Station.

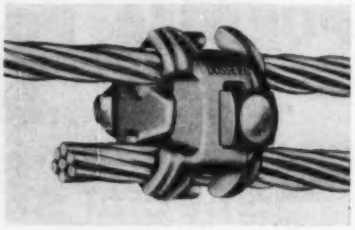
Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____

DC Lab Standard

Claimed to have a greater degree of shielding than a prior model, a dc laboratory standard (1/10 of 1%) is designated Model 325. A Cormag self-shielded mechanism and a special shield around entire mechanism are said to reveal no measurable error in a 5 oersted field. This makes unnecessary the positioning or mounting with relation to earth's magnetic field and obviates precautions in presence of current carrying conductors, according to manufacturer. The model is reportedly compensated for normal room temperatures and has a vernier type corrector for zero adjustment.



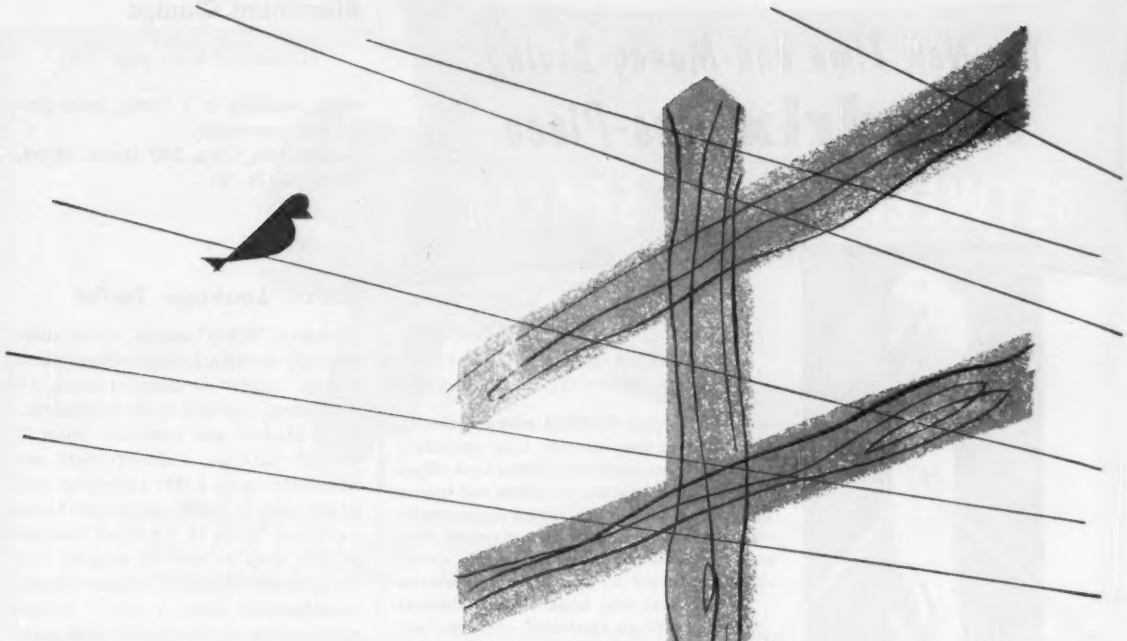
Weston Electrical Instrument Corp, Newark 5, N. J.



Aluminum Clamps

A primary feature of this aluminum clamp is its use of a spring washer in lieu of a lock washer. Reportedly, this gives the clamp the ability to counteract cold flow of soft aluminum conductors and maintain uniform clamping force during heat cycling. It utilizes a square head bolt which permits tightening with either one or two wrenches, with the option of using only one wrench since the bolt head is captive. The manufacturer claims this feature permits more than twice the clamping pressure to be ap-

(*Continued on page* 122)



Things to think about

when investing in treated wood products

Q. *How much longer than untreated ... ds, do treated woods last?*

A. Properly treated woods, such as woods treated by the American Creosoting Company, last four, five, even ten times as long as untreated woods. Under many conditions, wood treated by Amcreco may be considered essentially permanent.

Q. *Are all modern-day wood preservatives about equal in value?*

A. No, you can't assume that they are because none of the newly introduced preservatives have as yet been tried by the test of time. Creosote, on the other hand, which has been the number one wood preservative for over fifty years, is still number one in customer preference because of its established service record.

Q. *Are all treatment companies about the same — one's as capable as another?*

A. No, all treatment companies are not about the same. Some, such as the American Creosoting Company, which has been in the business for over fifty years, have more experience than others. Some, such as the American Creosoting Company, have had an opportunity to build up a treatment and service organization that is second to none.

The next time you are in need of wood products, specify treated wood products . . . poles, cross arms, conduit and other construction woods that have been pressure treated in creosote by the American Creosoting Company. We would appreciate the opportunity to quote on your needs.

AMCRECO
LOWRY PROCESS
CREOSOTED WOOD
Since 1904

AMERICAN CREOSOTING CORPORATION

Colonial Creosoting Company
Federal Creosoting Company
Indiana Creosoting Company

AMCREC
LOWRY PROCESS
CREOSOTED WOOD

Gulf States Creosoting Company
Georgia Creosoting Company
Kettle River Company

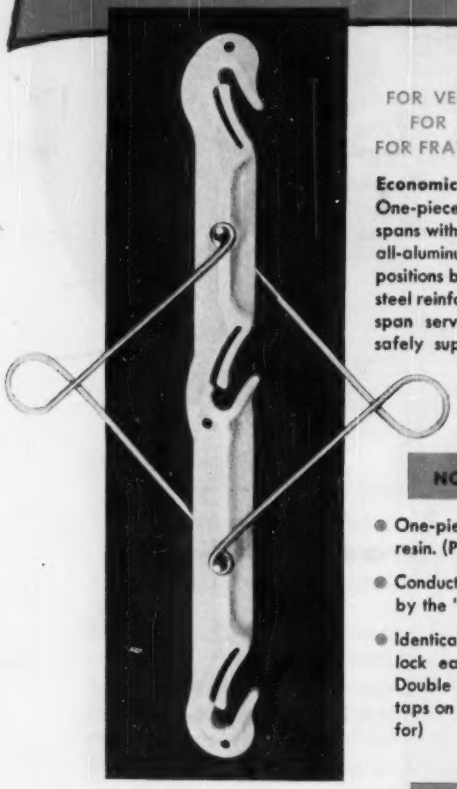
Georgia Forest Products Company

GENERAL OFFICES LOUISVILLE 2, KENTUCKY

The New Time and Money Saving

Hendrix *One-Piece*

BETWEEN-POLES SPACER



FOR VERTICAL SECONDARY CIRCUITS
FOR "MID-SPAN" SERVICE TAPS
FOR FRAYED OPEN WIRE SERVICE DROPS

Economical, easy to install, neat appearing. One-piece spacer permits long secondary spans with bare conductors. Lifting hook allows all-aluminum conductors for middle and bottom positions because vertical load is supported by steel reinforced conductor at each spacer. Mid-span service-drop connections easily made, safely supported by self-locking galvanized steel wire bails. Hendrix Spacers produce substantial operating and installation savings.

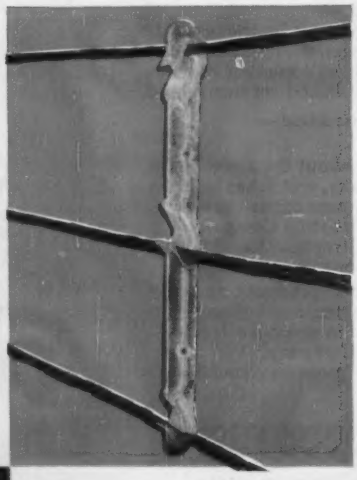
NOTE THESE ADVANTAGES

- One-piece molded of tough, resilient acrylic resin. (Patent applied for)
- Conductors quickly, easily installed in hooks by the "snap-in, lock-in" triggers.
- Identical halves of unique service-drop bails lock each other on spacer without bolts. Double construction of bail permits service taps on either or both sides. (Patent applied for)

EXCLUSIVE HENDRIX FEATURES

- Holes for tie wires (if needed) for each conductor.
- Full 1" bearing surface for abrasion-free conductor seat.
- Resilient trigger for easy "snap-in, lock-in" of conductors.
- One-piece molded of durable, weather-proof acrylic resin.
- Male and female end on each half of heavy galvanized steel wire bail spring-lock each other in place. Bail on each side for service tap on either or both sides.

Write for illustrated catalog sheet and full details to



Hendrix WIRE & CABLE Corp.

Dept. 101, 19 Watson Street • Boston 18, Massachusetts

Aluminum Clamps

(*Continued from page* 120)

plied, resulting in a better, more permanent connection.
Dossert Mfg Corp, 249 Huron Street, Brooklyn, N. Y.

'HiPot' Leakage Tester

Line of "HiPot" testers, which automatically deenergize high voltage when leakage current in samples reach 10 microamps, are said to be nondestructive. Models are available from 2 through 120 kv. Smaller units are adjustable up to 1,000 microamp and larger units to 5,000 microamp. Units are called Series H. Standard features include both ac and dc outputs and continuously adjustable output voltage, manufacturer says. A screw adjustment is said to recalibrate dual scale metering. Selfholding primary contactor prevents accidental reapplication of high voltage after a line failure.
Pesche Electronics, Inc,
17 Garden St, New Rochelle, N. Y.

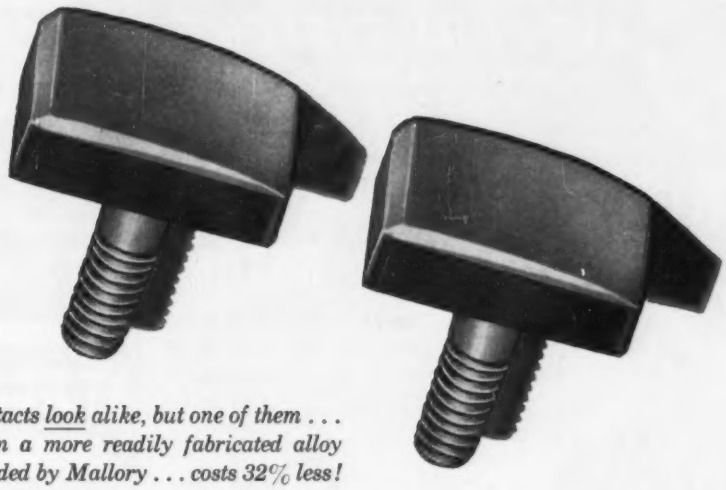
Magnetic Brake

Designed for application on electric motors where combustible dust creates hazards, this magnetic brake has maximum torque ratings of 10, 25, 50 and 75 lb ft, floor or motor mounting. Its use is in Class II, Groups E, F and G hazardous locations.

Approved by Underwriters Laboratories, the brake supplements a line of standard magnetic transmission equipment for 1/20 to 100-hp.
Stearns Electric Corp, Milwaukee, Wis.

(*More New Equipment on page* 124)

MALLORY



These contacts look alike, but one of them . . . made from a more readily fabricated alloy recommended by Mallory . . . costs 32% less!

Mallory Engineered Materials Selection Can Cut Your Contact Costs

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design** . . . for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design** . . . in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

CHOOSING the contact material that exactly matches your product requirements can often reduce over-all contact costs. For example, designers of a circuit breaker selected one of the Mallory Elkonite® materials for the contacts. This is a superior material for heavy-duty service, with high resistance to sticking and arc erosion.

Mallory engineers examined the product requirements . . . and recommended a change in materials. They found another ELKONITE, a higher silver content material, would give excellent performance on this medium-duty application. And because this material involved fewer manufacturing operations, the contacts could be made at lower cost. The customer's savings amounted to $10.16 per thousand . . . a total of over $8,000!

Mallory engineers are especially well qualified to help you get the best economy and performance in your contacts. They have a uniquely broad range of Mallory contact alloys from which to choose. And their extensive application experience is valuable in coordinating *all* phases of contact, backing member and assembly design to assure you of top value for your contact dollar. Write or call Mallory for a consultation on your particular application.

Expect more . . . get more from

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical — Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

Engineers—Please remember—these famous words:—

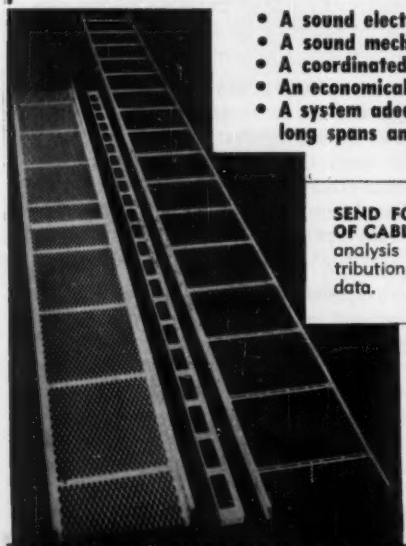
"There is hardly anything in this world that some man cannot make a little cheaper—and a little worse. . ."

Specify:

HUSKY
OR APPROVED EQUAL

and be certain that YOUR approval gives your client:

- A sound electrical system.
- A sound mechanical system.
- A coordinated system with unit responsibility.
- An economical job—the lowest "Installed Cost."
- A system adequate for indoor or outdoors, for long spans and ideal for future expansion.



SEND FOR YOUR COPY OF "THE STORY OF CABLE IN FREE AIR". A comprehensive analysis of the modern trend in power distribution with photographs and economic data.

THE HUSKY SUPPORT SYSTEM—the only cable support system approved and recommended by all major cable manufacturers.

AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

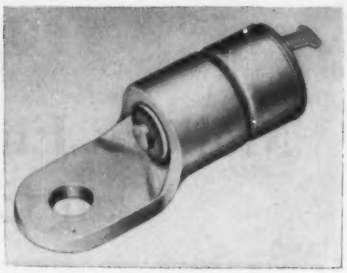
HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO

Wire Splice Cover

A service entrance wire splice cover made of black polyethylene is said to perform effectively under all climatic conditions. The device protects and covers the bare wire splice and compression splicing sleeve; the latter used to join the wire ends.

Named the "Wire Splice Protective Cover", it is designed to be elastic at the point the wire enters; it covers a wide range of wire sizes from No. 8 aluminum with a 0.9464 jacket (the minimum) to a No. 2 aluminum with a 0.056 jacket (the maximum). It is being marketed as a labor-saving device.

Plastic Engineering & Sales Corp, Fort Worth, Texas



Aluminum Terminal

A tin-plated aluminum terminal with a group of unique features is designed to accomodate aluminum wire in sizes 8-4/0. The "Termalum" terminal contains a cartridge with an oxide-removing compound that is sealed with a wire size, color coded, removable plastic plug. In addition, the tongue end of the barrel is provided with an inspection hole to ascertain whether leads are fully inserted; this inspection hole is equipped with a plastic sealing plug. High conductivity and corrosion resistance are among the terminal's advantages, manufacturer claims.

Aircraft-Marine Products, Inc. Harrisburg, Pa.

Polyester Varnish

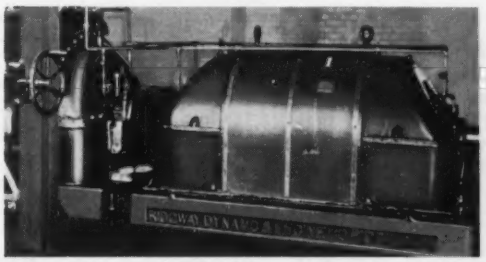
A polyester type varnish for use in combination with Class B wire enamel systems is reported to have 2 to 8 times the life of conventional Class A

(*Continued on page* 126)

Another achievement in the long record of ELLIOTT "FIRSTS"

Elliott's consistent leadership in the manufacture of large two-pole induction motors has kept designs in advance of the power industry's ever-expanding need for larger and larger boiler feed pump drivers. The motor shown above —the largest built to date—is one of three boiler-feed pump drives for a large midwest utility company. It incorporates the features of "super-quiet" design, for which Elliott two-pole induction motors are noted.

The first large two-pole motor built (shown below) was manufactured at Elliott's Ridgway Plant in 1916. The vast amount of experience in two-pole motor design and construction accumulated by Elliott since that time is reflected in superior present designs, and the satisfaction expressed by users.



Send for a copy of our new booklet, "Milestones," which gives more information about these machines. Address Elliott Company, Ridgway, Pennsylvania.

ELLIOTT Company

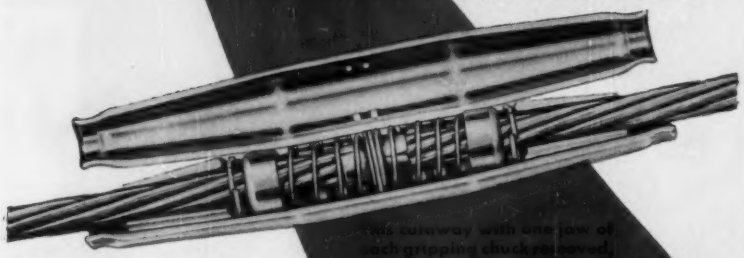
STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

R6-24

for ALL-ALUMINUM Conductors use...

Reliable TENSION SPLICES

FOR PERMANENT ELECTRICAL CONNECTIONS



This cutaway with one jaw of each gripping chuck removed, shows how pilot cups guide conductor through jaws to center stop.

The feed-thru design of the Reliable "SS" Series Tension Splice assures both a permanent mechanical splice and an efficient electrical connection. The pilot cups cap and guide the soft aluminum strands through the jaws to the center stop. Jaws cannot engage conductor at all until and unless the pilot cup, capping strand ends, has passed clear through the gripping area. Strand therein gripping area is free of burrs and in lay.

FOR SOLID CONDUCTOR

Pilot cups are not necessary with solid conductor, therefore these Reliable tension splices have release slots that permit re-use if desired. The same type gripping chucks assure permanent splices.

All Reliable Tension Splices for aluminum are equally efficient when used with aluminum alloy conductors . . . parts are chemically cleaned to give high surface conductivity, then greased and individually packaged at the factory. No tools are required for fast, efficient installation. Momentary tension is all that is needed to insure a permanent electrical and mechanical connection.

Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Illinois

Over 45 years of service to the Utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

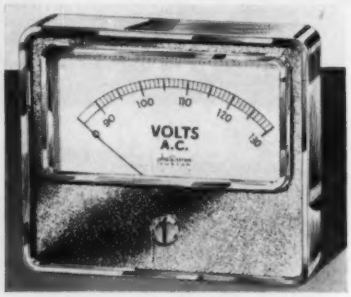
Polyester Varnish

(*Continued from page* 124)

varnishes when aged at 200 C in accelerated ageing tests, and simultaneously subjected to periodic 2,000-volt dialectric tests.

Called "Isonel Varnish", it is said to have the power factor of Class A varnishes from 20 to 130 C. It is heat reactive, and cures to a tough solid mass at a temperature of 120 C.

Schenectady Varnish Co, Inc, Schenectady, N. Y.



Expanded Scale Voltmeter

Ten times greater readability for greatly increased accuracy is reported with this expanded scale voltmeter by the manufacturer. The meter illustrated called the "Phaostron Custom Panel" meter, has an expanded 90 to 130-volt range. It is one of a variety of ranges and case styles that can be supplied either ac or dc. RMC readings are said to be true.

Phaostron Instrument & Electronic Co, South Pasadena, Calif.

More New Products

Minneapolis-Honeywell Regulator Micro Switch Division, Freeport, Ill., has an adjustable-lever-actuated basic **switch** for use on timers, computers, or other multi-mounted switch devices.

Weston Electrical Instrument Corp, Newark 5, N. Y., offers a new compact, lightweight **relay** for use where electromagnetic effects must be held to a minimum. Designated Model 1081, it is supplied for miniature 7-pin socket operation or with curved terminals for solder connection.

General Electric Co, Schenectady 5, N. Y., offers electric **power pack** for electrostatic air filters in room coolers. The system is said to provide nearly 100% pollen and 95% dirt filtering protection.

Wadsworth Electric Mfg Co, Covington, Ky., offers a two-pole **switching neutral circuit breaker** designed for gasoline stations.

Merix Chemical Co, 1021 E. 55th St, Chicago, Ill., has **destaticizers** for plastics (No. 79) and fabrics (No. 79-OL).

Dynac, Inc, subsidiary of Hewlett-Packard Co, 395 Page Mill Road, Palo Alto, Calif., offers **electronic counter** DY-2500 that measures speed, rpm, pressure and thickness by direct readings without conversion calculations.

Engineers Tool Co, 116 W. Main St, Lake City, Iowa, has a low-cost pole sounder **impaction tool** to test for rot.

Triton Mfg Co, East Haddam, Conn., offers a **soldering tool** with plier-action tips said to heat or cool instantly by hand lever manipulation.

Weston Electrical Instrument Corp, Newark 5, N. Y., offers a new compact, lightweight **relay** for use where electromagnetic effects must be held to a minimum. Designated Model 1081, it is supplied for miniature 7-pin socket operation or with curved terminals for solder connection.

Hobart Brothers Co, Troy, Ohio, has a new **arc welder** to be shown at the 1956 National Fall Meeting Welding Show. It is an ac-dc inert gas welder; features are said to include recessed control panels, removable side panels, and a magnetic contactor and removable rheostat for remote control.

Radio Corp of America, 30 Rockefeller Plaza, New York 20, N. Y., announces production of a **radio receiver** that operates unattended, provides visual and audible warnings of air alerts, and automatically seeks and finds Civil Defense "Conelrad" frequencies during an enemy attack.

(*More New Products on page* 128)

with ALL-ALUMINUM Conductors

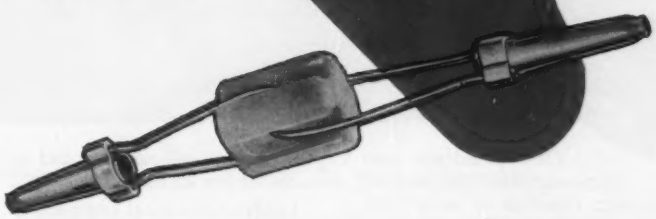
Reliable **FEED-THRU DEADENDS**

PROVIDE UNFAILING SERVICE

Reliable experience in building deadends for copper has solved the problem of deadending aluminum conductor. The Reliable designed feed thru gripping chuck that has proved itself in millions of unfailing applications is used in this line of deadends.

Clamping pressure is smoothly distributed and does not deform the conductor—Deadending unit is light enough to avoid concentrating vibration stresses. Exhaustive tests have been made to insure efficiency. As in Reliable Tension Splices, no tools are required for fast, economical installation.

INSULATED SPLICING ASSEMBLY



This Reliable assembly offers economy of time and material as well as permanent performance. Insulated splicing assemblies are ideal for series lighting circuits and for sectionalizing circuits without double arm deadending.

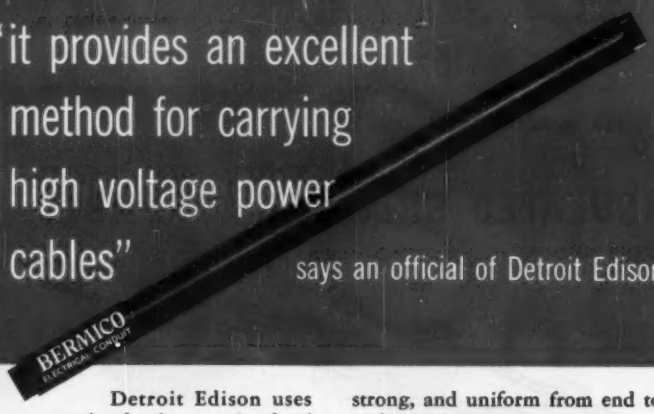
Reliable **ELECTRIC COMPANY** 3145 Carroll Avenue Chicago 12, Illinois

Over 45 years of service to the Utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

BERMICO® electrical conduit is used by Detroit Edison because...

"it provides an excellent method for carrying high voltage power cables" says an official of Detroit Edison



Detroit Edison uses carload after carload of Bermico Conduit to carry high voltage cables supplying continuous power to the automotive center of the world.

Made to precision standards from cellulose impregnated with coal tar pitch, Bermico Conduit is alkali-resistant, acid-resistant, strong, and uniform from end to end—yet low in cost.

Leading electrical contractors and public utilities everywhere are getting the maximum protection and ease of installation that it provides. You can, too, by always specifying Bermico Conduit. Immediate shipment of all sizes and fittings guaranteed.

Distributed by WESTINGHOUSE Electrical Supply Company
Offices in principal cities

BROWN COMPANY
Berlin, New Hampshire
GENERAL SALES OFFICE: 150 CAUSEWAY STREET, BOSTON 14, MASS.

More New Products

(*Continued from page* 127)

Westinghouse Electric Corp, Pittsburg 30, Pa., makes available its 400 A-H1 **lamps** with Weather Duty hard glass bulbs as standard.

Tork Clock Co, Mount Vernon, N. Y., has a **time control** that makes possible all night lighting on selected days. This device, designated ZSK, has an Astronomical dial and a Skip-A-Day control.

Hobart Brothers Co, Troy, Ohio, has a new **arc welder** to be shown at the 1956 National Fall Meeting Welding Show. It is an ac-dc inert gas welder; features are said to include recessed control panels, removable side panels, and a magnetic contactor and removable rheostat for remote control.

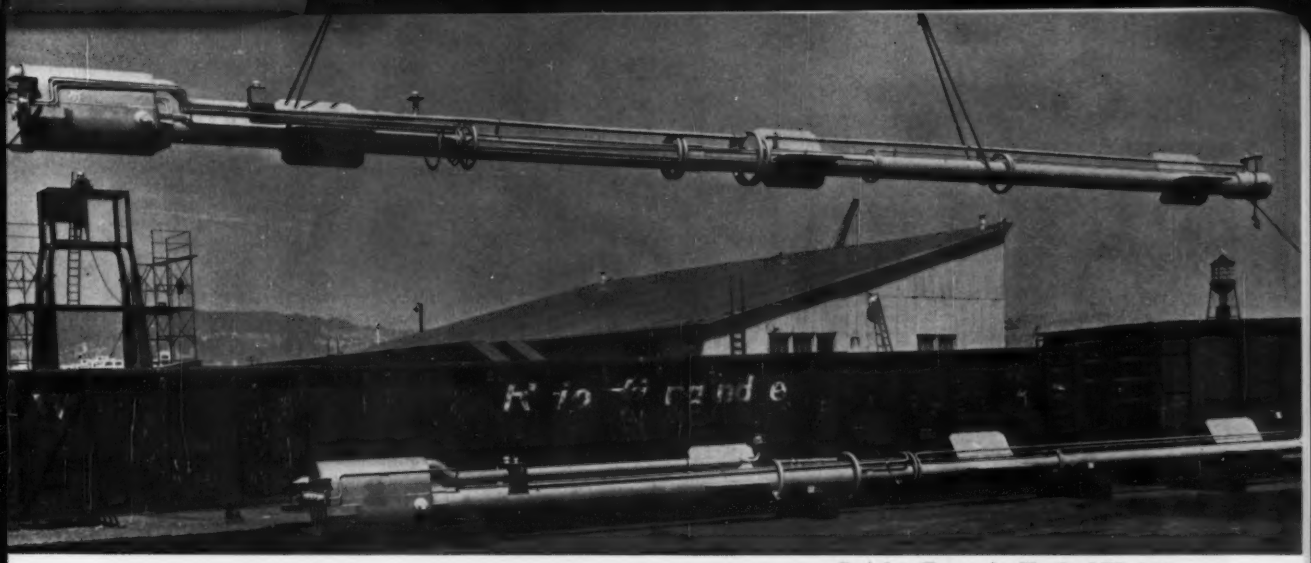
Allied Mfg & Sales Co, 3101 W. Grand Ave, Chicago 22, Ill., has a mobile 500 lb-capacity **hydraulic lift.** Designed for interior and exterior work, it can reportedly be stopped and locked in any height from 9 to 40 ft, and requires only one operator.

Bristol Co, Waterbury, Conn., has announced a high speed, self-balancing **potentiometer** for use with analog-to-digital conversion devices. Called the "Dynamaster", it can be equipped with most of the standard digital read-out devices presently available.

Federal Telephone & Radio Co, Clifton, N. J., introduces a new line of 45-volt **selenium rectifiers** in standard sizes from ½ in. to 2 in. Their cells are said to exhibit high stability and very low "leakage" current.

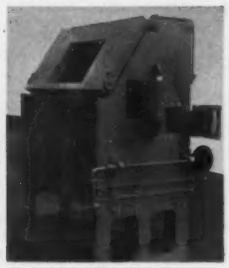
Yellow Springs Instrument Co, Yellow Springs, Ohio offers a **telethermometer** using interchangeable thermistor probes. The portable, battery-powered device covers a range of 30 to 110 F, the manufacturer reports.

Burling Instrument Co, 16 River Road, Chatham, N. J., has announced a new series of differential expansion type **temperature controllers.** Called Models F-1C, F-2C, and F2C, the new controllers reportedly offer accurate on-off temperature control of heating operations, processes, and safety alarms.



*Stainless Towers for Hanford Works**

Cavity for Radiation Laboratory

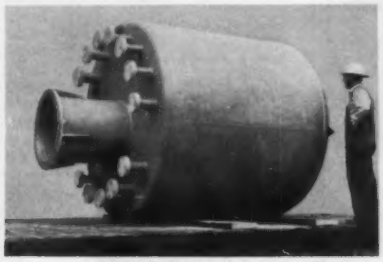


*One of 13 Junior Caves for Hanford Works**

DO YOU SEEK THIS EXPERIENCE WITH ATOMIC POWER PLANT EQUIPMENT?

*Structure Assembly for Hanford Works**

1 of 20 - 90' Span Cranes for Peter Kiewit



Stainless Tanks for Blaw-Knox

*Stainless Autoclaves for Hanford Works**

Here are 4 Paceco gained-thru-experience skills you may be seeking for designing and production of atomic power equipment

1. Skill in welding and heat treating of steel and alloys, both light and heavy gauge.
2. Skill in fabricating of corrosion-resistant metals and alloys.
3. Skill in producing heavy equipment to extremely precise mechanical tolerances.
4. Skill in designing and building equipment to resist extreme pressures and intense temperatures.

Some units we have built direct from buyer's plans. In other instances, however, Paceco engineers work with the buyer *at the designing stage*. Experience has proved this consultation may sharply lower initial cost, improve operational efficiency and reduce maintenance. We invite consultation on your requirements.

*Operated for the U. S. Government by General Electric Co.

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"TAILORS OF STEEL"®

PACIFIC COAST ENGINEERING COMPANY

ENGINEERS • MACHINISTS • FABRICATORS

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MR. PRESIDENT:

WHAT DO YOU KNOW ABOUT RT&E?

As one of America's leaders in the power industry, we think you should know something about one of America's leading suppliers of equipment to the power industry.

We said "leading" not largest. You should know that RT&E, while not big compared to the giants, is nevertheless big in service, in quality, in progress. We've packed hundreds of man years of experience into our ten years of manufacturing.

We think you'll approve our philosophy that we smaller suppliers are most important to the American economy. Sure, we'll be big some day, but in the meanwhile, we help keep the bigger boys on their toes.

For example, no other transformer manufacturer provides a 5 year guarantee or an externally operated tap changer as standard. We do.

All we want to say here is this: Remember the name RT&E. You'll hear it again.

RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

CATALOGS—BULLETINS

• **THERMISTORS:** Manual TH-13A, 53 pages, discusses thermally sensitive resistors for automatic detection, measurement and control of energy. General Electric Co, Metallurgical Products Dept, Detroit 32, Mich.

• **METERS, CONTROLS:** Measuring and control instruments are described in 8-page Bulletin G15-1. Bailey Meter Co, 1050 Ivanhoe Road, Cleveland 10, Ohio.

• **TEFLON, RULON:** Data on bondability of Teflon and Rulon are included in three publications: 1. Bondable Tetrafluonoethylene Products. 2. Teflon and Rulon Skived Tape, Plain and Bondable. 3. Adhesive W-10 for use with Teflon and Rulon. Dixon Corp, Bristol, R. I.

• **RECTIFIERS:** Two bulletins (SR-A and SN-856) present characteristics of Silicon rectifiers—peak inverse voltage, maximum current ratings, construction and application. International Rectifier Corp, El Segundo, Calif.

• **THRUSTOR:** Eight page bulletin, designated GEA-1614D, cites increased productivity, reliability, low maintenance, safety, versatility, uniformity of action, and simplified installation of GE Thrustor units. General Electric Co, Schenectady 5, N. Y.

• **SAFETY CONTROLS:** A revised 8-page condensed catalog and price list of boiler safety devices and related information. McDonnell & Miller, Inc, 3500 N. Spaulding Ave, Chicago 18, Ill.

• **BOILER SERVICE:** A publication aimed toward better care and maintenance of products in the field. Contains trouble-shooting and service date on boiler controls. The booklet is designed to simplify stocking of repair parts for jobbers. McDonnell & Miller, Inc, 3500 N. Spaulding Ave, Chicago 18, Ill.

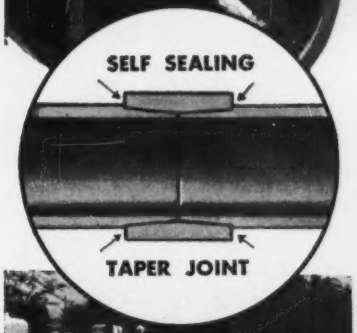
• **CONSTANT VOLTAGE:** Booklet gives technical date for 6 standard design, regulated dc power supplies for intermittant, variable, pulse and high amperage loads. Power supplies combine a constant voltage transformer, a germanium power rectifier, and a high capacitance filter without choke. Available from Sola Electric Co, 4633 W. 16th Street, Chicago 50, Ill.

• **CONTACTS AND RIVETS:** Catalog describing 300 standard electrical contacts and rivets in a wide range of precious and base metals, plus many cold headed specialties, is available from Deringer Metallurgical Corp, Skokie, Ill.

• **SOLDER CORE CONTACTS:** Technical information on solder core contacts, including illustrations, descriptions and specifications of a perfected method of prefilling contacts with a solder alloy of any specied composition can be obtained by writing DeJur Amsco Corp, Electronic Sales Div, 45-01 Northern Blvd, Long Island City 1, N. Y.

• **IRRATHENE:** Brochure of 12 pages gives a technical report on irradiated polyethylene—Irrathene. Describes the new insulating material's electrical and physical properties, performance characteristics, typical applications and techniques of use. Write General Electric Co, Chemical Development Dept, Pittsfield, Mass.

SMOOTH BORE!



Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

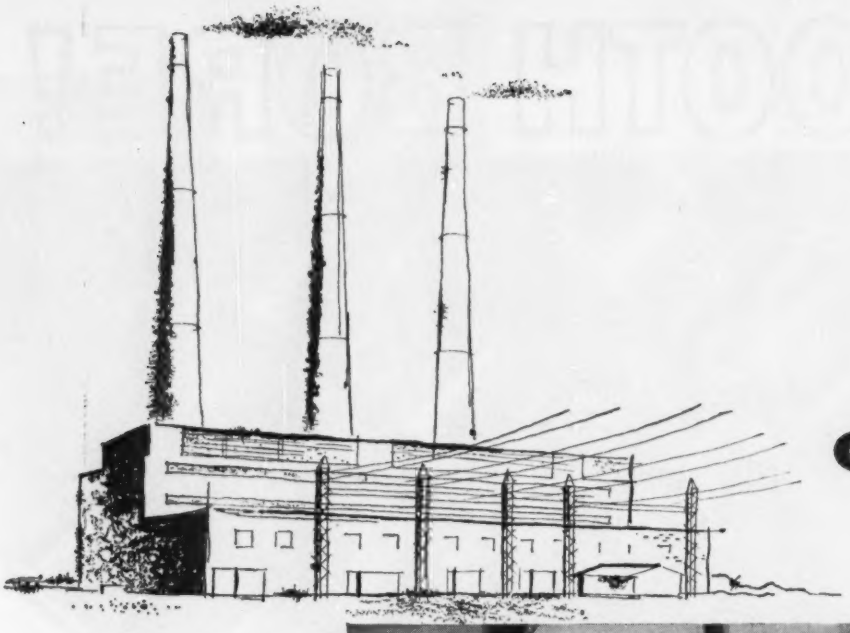
Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

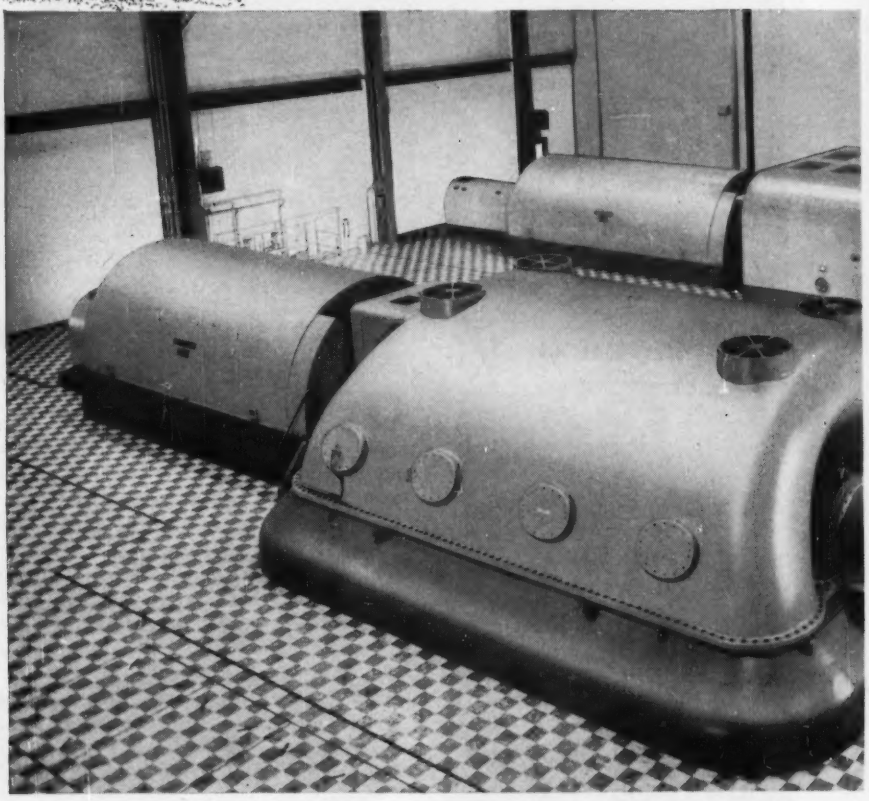
WRITE DEPT. EW-106 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT



OVEC's

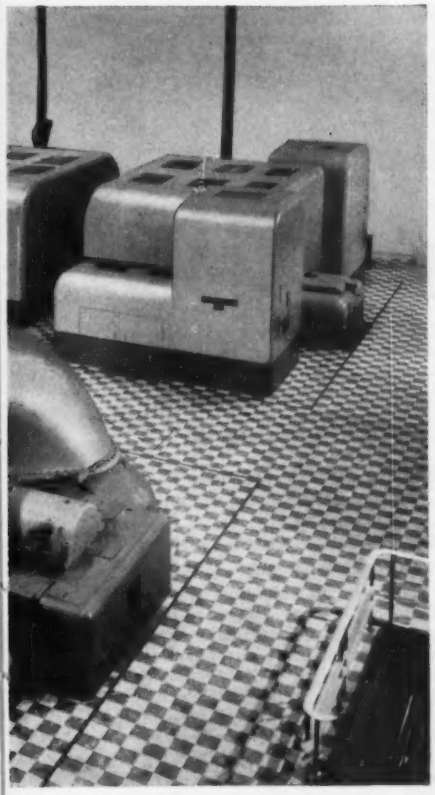


OVEC IS OWNED BY THE FOLLOWING PRIVATE ELECTRIC UTILITIES:

Appalachian Electric Power Company* • The Cincinnati Gas & Electric Company
Columbus and Southern Ohio Electric Company • The Dayton Power and Light Company
Indiana & Michigan Electric Company* • Kentucky Utilities Company
Louisville Gas and Electric Company • Monongahela Power Company** • Ohio Edison Company
Ohio Power Company* • Pennsylvania Power Company*** • The Potomac Edison Company**
Southern Indiana Gas and Electric Company • The Toledo Edison Company • West Penn Power Company**

*Subsidiary of American Gas and Electric Co. **Subsidiary of The West Penn Electric Co. ***Subsidiary of Ohio Edison Co.

Kyger Creek Station



...best heat rate in the nation for 1955!

In the fast-moving race to higher and higher station efficiencies, Kyger Creek Plant of the Ohio Valley Electric Corporation placed first for the year 1955 according to figures released by the Federal Power Commission. The official rate was 9110 btu/kwhr.

Four of the five Kyger Creek turbine-generators are Westinghouse cross compound, double flow, rated 217,260 kw.

J-50591

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*

because ONLY ELECTROMODE HEATERS HAVE THE SAFETY GRID

This is a completely sealed-in **CAST-ALUMINUM HEATING ELEMENT.** Absolutely no glowing elements or exposed open coils. Tops in safety, efficiency and economy. The Electromode heating element is guaranteed for five years.

because ELECTROMODE LEADS IN ELECTRIC HEATING

ELECTROMODE
Division Of
COMMERCIAL CONTROLS CORPORATION

For more than a quarter century Electromode has concentrated on one specific industry—heating by electricity. From the beginning Electromode has pioneered for a quality product and has continued to expand its line to include the most modern developments in electric heating equipment to serve present day needs. As a result of Electromode's firm stand on quality, complete satisfaction has been the rule with those who either sell, install or use Electromode electric heating equipment.

MAIL COUPON TODAY

MAIL COUPON! Please send your FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating.

ELECTROMODE Division
Commercial Controls Corporation
Dept. EW-106, 45 Crouch Street, Rochester 3, N. Y.

We are interested in ☐ Home ☐ Industrial ☐ Farm

Name.....

Address.....

City.....Zone.....State.....

BOOKS

Received Since August 27, 1956

Vacuum-Tube Circuits and Transistors. By Lawrence Baker Arguimbau. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 646 pages, illustrated. Price $10.25.

Applied Electrical Measurements. By Isaac F. Kinnard. Published by John Wiley & Sons, Inc., 440 Fourth Ave, New York 16, N. Y. 600 pages, illustrated. Price $15.00.

Pulse and Digital Circuits. By Jacob Millman and Herbert Taub. Published by McGraw-Hill Book Co, Inc., 330 W. 42nd St, New York 36, N. Y. 687 pages, illustrated. Price $12.00.

Neutral Grounding. By R. Willheim and M. Waters. Published by Elsevier Publishing Co. Distributed by D. Van Nostrand Co, Inc., 126 Alexander St, Princeton, N. Y. 669 pages, illustrated. Price $15.00.

How To Plan Grounding

Erdungen in Wechselstromanlagen uber 1 kV —2nd Edition. By Walther Koch. Published by Springer-Verlag, Reichpietschufer 20, Berlin W 35, Germany. 192 pages, illustrated. Price DM 19.50.

Formulas and computing methods added in this second edition make the book a comprehensive treatise on electrical system grounding. It runs the gamut from high-voltage transmission circuits to distribution transformers and low-voltage switchgear. Examples demonstrate the calculation of grounding systems.

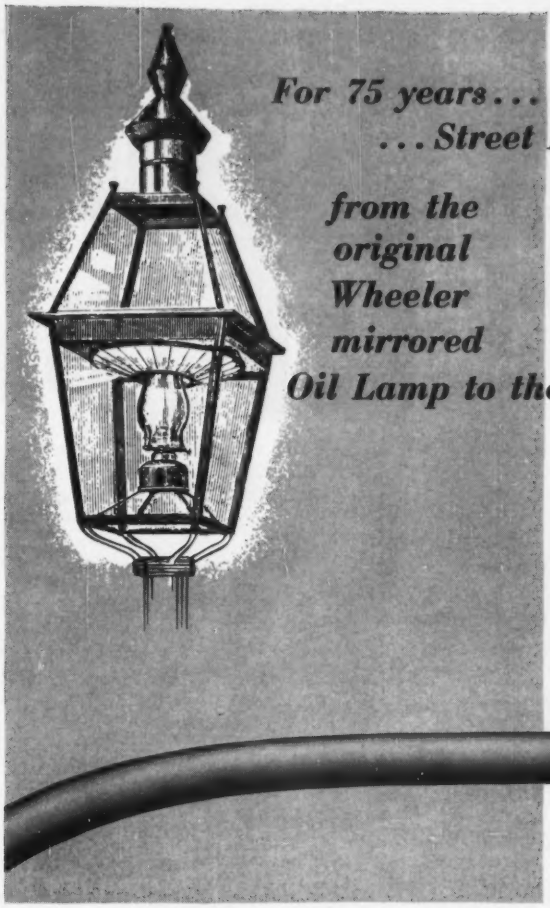
Written primarily for electrical students, this book would also serve practicing engineers as a guide and text for grounding electrical systems and equipment.

How to Find TV Trouble

Introduction to TV Servicing. By H. L. Swaluw and J. Van der Woerd. Published by N. V. Philips' Gloeilampenfabricken, Eindhoven, Holland. 271 pages, illustrated. Price $5.50.

This recent addition to Philips' Technical Library is devoted to servicing domestic TV receivers. The book is written for service technicians with sound knowledge of circuit fundamentals. But its presentation is clear and devoid of the complicated mathematics which typify many books on electronics. Objective is to encourage servicemen to work more in clients' home by helping them to diagnose symptoms of TV trouble with portable test equipment.

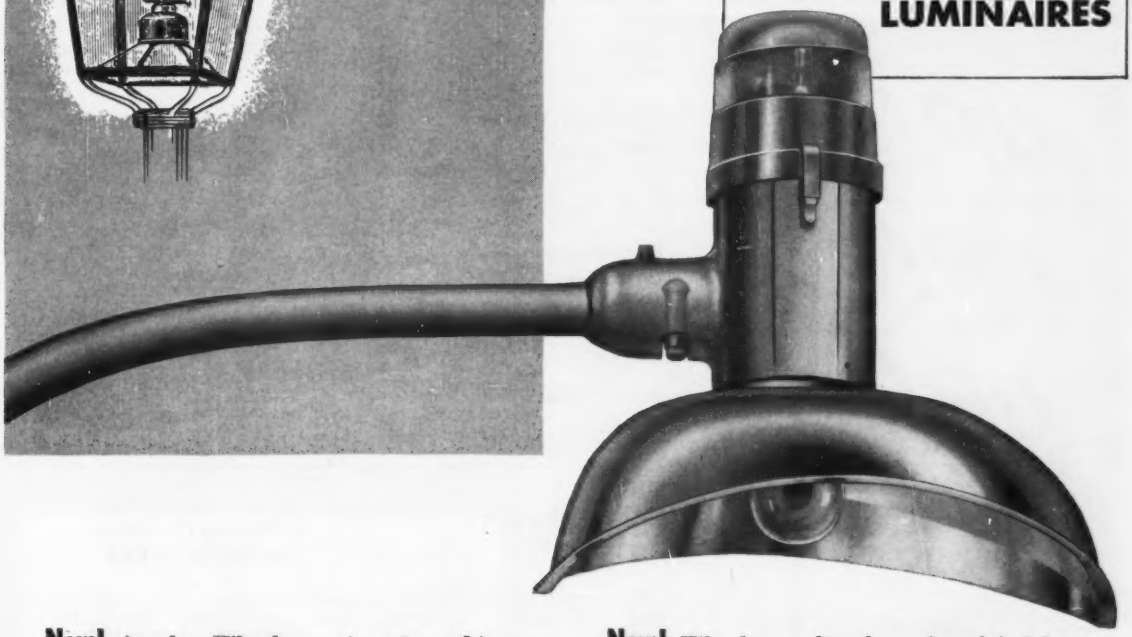
Utility engineers whose duties include investigation of TVI complaints would find this book helpful in differentiating between TV trouble and actual interference. And many other utility employees would find it a useful guide in correcting minor ailments of their home TV equipment.



For 75 years...
...Street Lighting for a safer America!

from the original Wheeler mirrored Oil Lamp to the modern

INTEGRAL PHOTOELECTRIC CONTROL LUMINAIRES



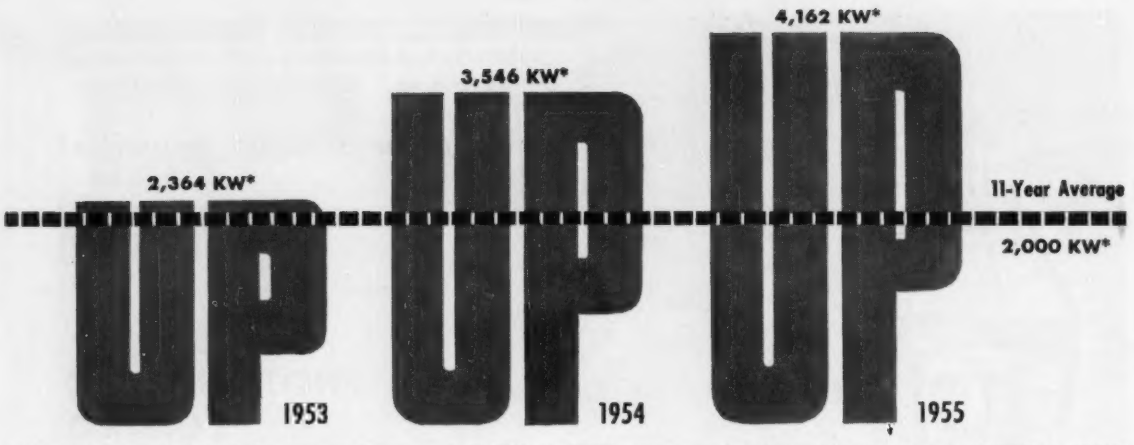
New! Another Wheeler engineering achievement that makes street lighting budgets go further. A low cost, small multiple head with integral photoelectric control. Inside or outside wired for Screw Ring or Groove Neck style of Reflector attachment.

New! Wheeler quality throughout! A deluxe All-Aluminum Crescent Reflector providing I. E. S. type I or type II distribution. Aluminum Crescent available with all EEI-NEMA standard type necks. Other types also available.

Experimental installation of Wheeler Crescent-48 Luminaires on U. S. Route 1 in Old Lyme, Conn., pioneering Linear Low Brightness Mercury Street and Highway Lighting.

75th Anniversary
1881 1956

Wheeler REFLECTOR COMPANY
275 Congress Street, Boston, Massachusetts



**Average new commercial cooking load per year per utility reporting in ELECTRICAL WORLD's surveys. See "2nd Commercial Cooking Survey," ELECTRICAL WORLD, August 27, 1956, Pages 36 to 51. Reprints available from HOTPOINT.*

		COMMERCIAL COOKING FACTS
UP!	Pennsylvania Power and Light Co.	Over $2,000,000 in new E.A.R. in 9 years
UP!	Appalachian Electric Power Co.	$392,000 in new E.A.R. in 1955
UP!	Atlantic City Electric Co.	Over 5 kw new load per customer, 1955
UP!	Southern California Edison Co.	New load up from 6,900 kw (1954) to 16,920 kw (1955)
UP!	Potomac Edison Co.	Commercial cooking saturation now over 19 kw per customer
UP!	Year end projection, 1956 (estimated)	Up 25%

"Commercial Cooking is Hot Load"

(Editorial: Reprinted from ELECTRICAL WORLD, Sept. 10, 1956, page 5)

Commercial cooking can no longer be looked upon as just a promising load building opportunity. Today it is solid business.

This is apparent to everyone who read *Electrical World's* second survey in a recent issue (Aug. 27, p. 36). Companies like Appalachian Electric Power and Pennsylvania Power & Light are grossing $2 million and more each year from this single load. Southern California Edison Co. added nearly a half-million dollars of cooking revenues last year.

And the substantial returns are by no means limited only to utilities with large prospect lists. Kentucky Power Co., with only 600 food service accounts to draw on, worked its market for $72,000 in new commercial cooking business last year. Similarly Gulf States Utilities drew $134,000 in new money from only 1,080 prospects.

Cooking kwhr sales for the industry this year likewise look good. Already they're about 25% ahead of '55, according to one equipment manufacturer's estimate.

KW sales soar

with Commercial Electric Cooking!

With commercial cooking E.A.R. nearing the $1 million mark, Metropolitan Edison Co. added all-electric kitchens in 30 out of 33 new schools in one year . . . points with pride to such famed installations as those at the Berkshire and Abraham Lincoln Hotels. Shown above is the 401.5 kw installation at Reading (Penna.) Hospital.

Like space heating, commercial cooking offers a high concentration of kwhr from few installations. A fully-equipped all-electric kitchen can put a load on a utility's lines of anywhere from 100 kw for a large restaurant to 300 kw or better for a hospital. To a single company with 2,300 food-service customers (the average for the utilities in EW's survey) this means a total potential of:

- 69,000 kw demand (based on a conservative average of 30 kw for each food-service customer). This is the total capacity of a good-sized turbine generator;
- $1¾ million in annual revenues (at $25 per kw).

And, happily enough, commercial cooking diversifies well with other classes of business, has a good annual load factor.

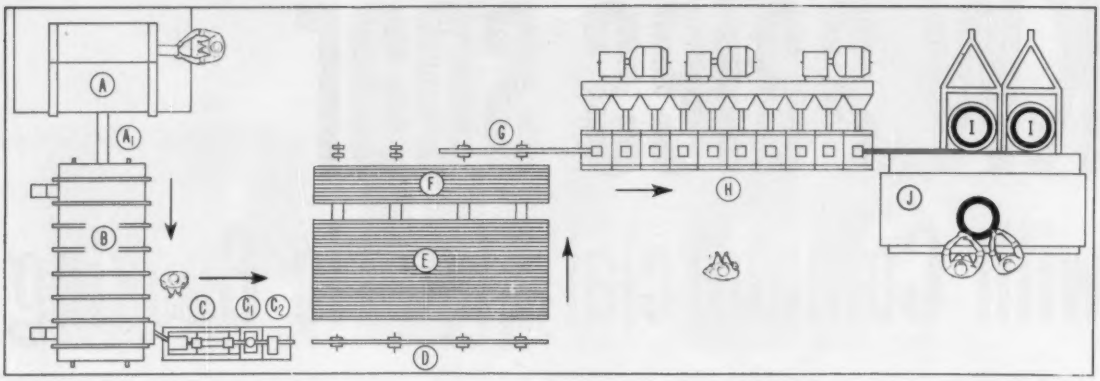
Utilities which go after the load know this. A survey of 34 utilities (EW July 23, p. 97) shows cooking is getting a modest but steadily increasing share of the utilities' commercial promotion dollar—up 43% since 1940. Meanwhile, several other commercial power applications are suffering budget cutbacks.

With at least 533,000 food service outlets in the U. S., whose cooking requirements could total at least 15 million kw, the "poor little rich load" is no longer so poor or so little. As for how rich it is, the figures above speak for themselves.

HOTPOINT has a complete assortment of commercial cooking plans, programs, and facts for power companies. Write, wire or phone us and we will make our full resources available to you.

Hotpoint All-Electric Commercial Cooking

Hotpoint Co., a Division of General Electric Company
Commercial Equipment Department, 265 So. Seeley Ave.,
Chicago 12, Illinois



Aluminum Rod Rolled under 'Quality Control'

Southern Electrical Corp adopts new continuous process and credits it with turning out high quality product for electrical conductor use

A new "quality control" process is being used by the Southern Electrical Corp, Chattanooga, in the continuous casting and rolling of aluminum rod for electrical conductors. A. H. Tessmann, vice-president, stated that the new technique reduces significantly initial equipment and operating costs and also results in good performance of equipment and high quality of product.

Known as the Tessmann Continuous Horizontal Process, it was developed expressly for Southern Electrical Corp. The processing equipment consists of melting units, casting units, heat treating unit, and rolling mill along with associated coiling and stacking equipment. The mill has a potential capacity of 16,000 lb per hr.

Melting Equipment Described

The melting units consist of low-frequency twin-inductor type, 3-phase furnaces (See A in illustration) that are charged periodically with aluminum pig and scrap. The charge is melted, brought to pouring temperature, cleaned, and sampled. After spectrographic determinations have been made and elements adjusted for proper alloy, the charge is dumped through runners (A1) into a resistance-heated holding furnace (B).

In the holding furnace the charge is blended with previous charges, and the molten mass is maintained at casting temperature. To assure uniform quality of the cast product, the holding furnace is also sampled and spectrographically analyzed after each charge has been transferred from the melting furnace and blended. It is extremely important that this "quality control" be exercised at the very beginning of the process. Subsequent samples are taken at the end of the casting and rolling stages.

Casting Is Automatic

The casting unit (C) consists of a metal tundish, a mold, a vacuum system, a set of withdrawing rolls, and a cut-off saw. Molten metal flow from the furnace into the tundish is regulated by a stopper mechanism so that input of molten metal is equivalent to output of continuous cast bar. A set of withdrawing rolls (C1) continuously withdraws the bar from the mold and feeds the casting to a runout table and a cut-off saw (C2). Bars are cut automatically to required lengths (D) and are conveyed to a stacking table (E) ready for feeding into a homogenizing furnace (F).

Bars are fed automatically onto a chain drawn table in the furnace where they are brought to homogenizing and rolling temperature. They are ejected automatically to a runout table (G) as the rolling mill demands them.

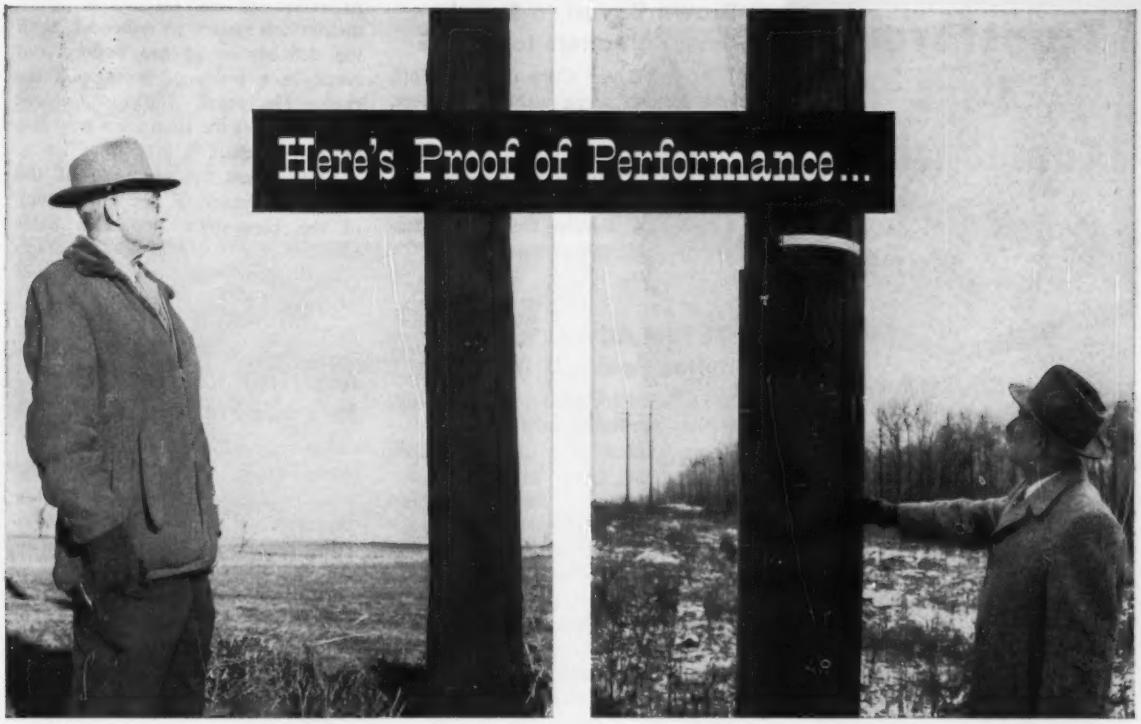
Rolling equipment (H) consists of a multiple stand tandem mill for single or double rod production. Roll-over switches on the rod runout table automatically energize feeders in the homogenizing furnace, and the bar is fed to the rolling mill. Upon entering the rolling mill, the bar passes in a continuous flow through two-high mills and the intervening guides. Completed coils (I) of the rod are ejected onto a runout conveyer (J) which moves to an unloading carriage.

This mechanized process permits converting aluminum pig metal to finished rod under one roof and allows for continuous quality control in all steps.

Elliott Co Gets Order for Nine 5,000-hp Motors

Elliott Co, Inc, of Ridgway, Pa., has received an order for nine 5,000-hp, 3,600-rpm, 3-phase, 60-cycle, 4.16-kv, totally enclosed, water-to-air cooled squirrel cage induction motors for use with boiler feed water pumps to be manufactured by Pacific Pumps, Inc, of Huntington Park, Calif. Ultimately, the motors and pumping equipment will be installed in a station in the city of Memphis, Tenn. The motors are to be shipped in 1957.

(*More M&M on page* 140)



In 1928, The Pennsylvania Power & Light Company installed 163 pressure-creosoted poles on a distribution line in Lancaster County, Pa. Not one of these pressure-creosoted poles has been replaced due to decay or preservative failure. Amer Krieder, Pole Inspector, looks over one of these still-serviceable veterans.

In 1954, a total of 180 pressure-creosoted poles was installed for the new transmission line in an area between Hazelton and Wilkes-Barre, Pa. L. Z. Ludorf, Assistant to Superintendent of Lines and Substations, is shown here with one of the 55-foot poles in this line.

"Not one pole installed in 1928 has been replaced due to preservative failure,"

reports Pennsylvania Utility

The Pennsylvania Power & Light Company serves 674,000 customers in a 10,000 square mile area in Eastern Pennsylvania. On its many transmission and distribution lines it has approximately 250,000 pressure-creosoted yellow pine poles in service.

Mr. D. A. Campbell, Jr., Superintendent of Lines and Substations, has this to say about pressure-creosoting: "We have been specifying the pressure-creosote treatment for our poles since 1938, but we do have a record of a number of pressure-creosoted poles installed in 1928. Our test borings of these poles in 1949 indicated that we would not have to test again for at least another ten years. Our replacements due to decay are hardly worth mentioning. The fine performance of our pressure-creosoted poles in our old lines has certainly influenced us to use pressure-creosoted poles in our new lines. We feel that, on the basis of decay, the life expectancy of a pressure-creosoted pole is at least 40 years. We are also specifying pressure-creosoted crossarms to match the life of pressure-creosoted poles. This cuts our replacement and maintenance costs."

This is just one example of how power companies are benefiting from the long service life of pressure-creosoted poles and crossarms. For more data on pressure-treatment and USS Creosote—the quality preservative—write United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.; or call the nearest United States Steel Chemical Sales Office.

USS CREOSOTE

SALES OFFICES IN PITTSBURGH, NEW YORK, CHICAGO, CLEVELAND, SALT LAKE CITY AND FAIRFIELD, ALA.

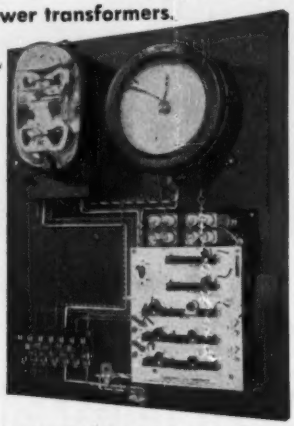
USS

UNITED STATES STEEL

Transformer Loss Compensator

Saves you Money!

BECAUSE it provides an accurate means of measuring the energy and demands of high-voltage services at the low-voltage side of the power transformers.



This installation at 2.3 kv saved about $2600 compared with 34.5 kv metering; it saves about $5500 over metering at 69 kv.

THE TESCO compensator adds to the registration of the watthour meter an amount equal to the sum of the iron and copper losses of the transformer bank. It may be used with practically any type of watthour meter and . . . importantly . . . no changes are made in the meter itself, either structurally or in adjustments . . . It is produced in two and three element types for use with two-element or three-element meters on any type circuit.

Some of the Users . . .

Phila. Electric Co. Penna. Power & Light Co. Texas Power & Light Co. U. S. Bureau of Recl. Public Service Co. of New Hampshire. Utah Power & Light Co. Northern States Power Co.

Get your book now FREE

Detailed information on operation, installation, applications. Write for Bulletin NO. 63-A.

EASTERN SPECIALTY CO.

PHILADELPHIA 40, PA.

Brown Boveri to Supply Seven Breakers to PSE&G

Brown Boveri Corp of New York will furnish seven airblast breakers, each with an interrupting rating of 100,000 Mva, to Public Service Electric & Gas Co. These breakers will be located in the 132-kv yard of the 550,000-kw Bergen Generating Station now being constructed.

GE Film Advocates Better Power Distribution

The need for adequate and modern power distribution in industrial plants is dramatized in a new 30-minute sound and color motion picture, "Goodbye Steve," which has been produced by the General Electric Co for showings to manufacturing and engineering audiences. The film is the latest in a series of productions by G E in a program to help increase the nation's standard of living and industrial productivity by stimulating broader and more efficient use of electricity.

"Goodbye Steve" tells the story of a young electrical engineer whose warnings to his company concerning its antiquated and inadequate power distribution system go unheeded, until the deficiencies he has pointed out result in a series of production-disrupting incidents. The management finally realizes the need for a new and modern system.

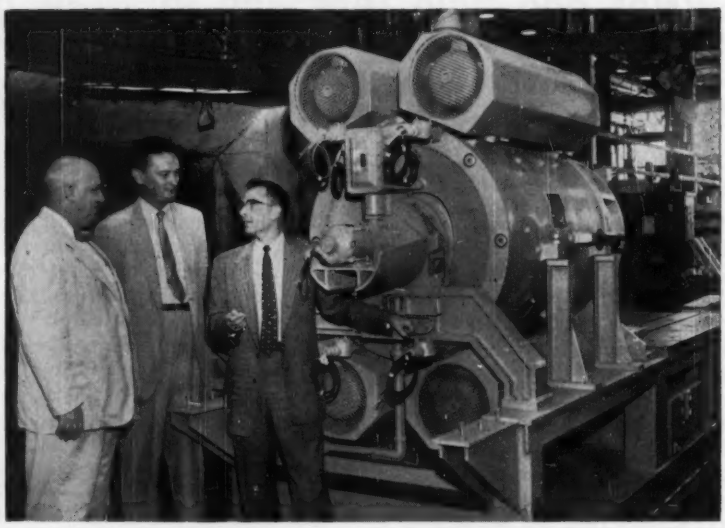
Speaking at the premiere of the new G E picture, F. W. McChesney of the company's Apparatus Sales Division predicted that by 1966 each production worker in the U. S. will use 36,000 kwhr on his job.

AmerTran Reorganized, Resumes Production

American Transformer Co, a former manufacturer of power and specialty transformers, has returned to the electrical industry scene after reorganization as a division of Standard Electronics Corp.

Establishing manufacturing facilities again at Newark, N. J. the firm has started producing special transformers, reactors, rectifiers, power supplies, high voltage test sets, and Transtat variable voltage transformers. The company's products are to be

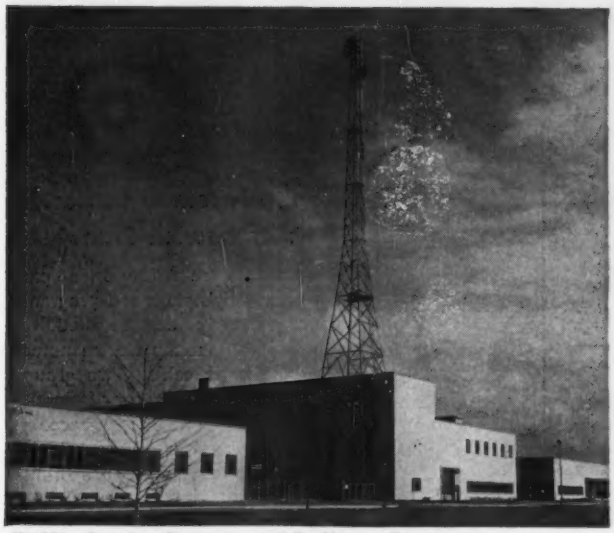
(*Continued on page* 142)



Reliance Builds 'Vanguard' Dynamometer

Huge explosion-proof dynamometer, built by Reliance Electric & Engineering Co, develops 200 hp in a speed range between 12,500 and 50,000 rpm. Control unit provides speed and torque control accuracy to 0.1% It'll be used for testing component parts of Project Vanguard—the man-made Earth Satellite

MICROWAVE COMMUNICATIONS:



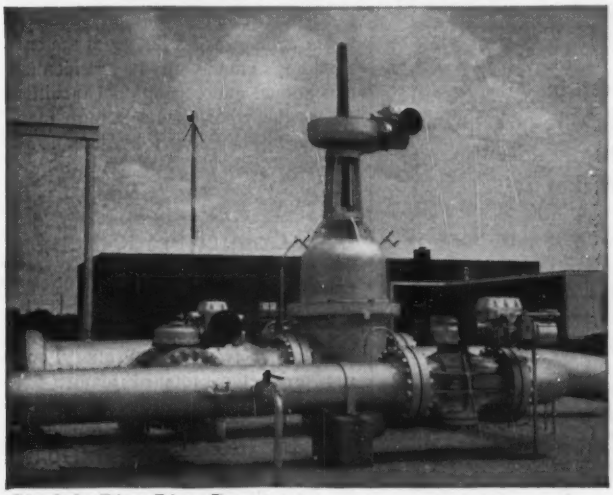
Public Service Company of Indiana, Inc.

Microwave radio aids in controlling supply of electricity for the state of Indiana. Four branches of a G-E Microwave system—combining voice and telemetering channels—originate at utility headquarters in Plainfield. From this hub regional demands are controlled according to local needs. Load control information obtained by remote control telemetering is analyzed, then transmitted to generating stations in necessary areas. Entire electrical power system is linked solidly by microwave radio.

Busy Tower

Antenna receives, transmits, or relays voice or telemetering signals. Antennas like these link headquarters with generating plants and sub-stations over a wide area.

P.S.I.'s microwave network provides utmost dependability because of standby equipment, fail safe feature, and because equipment can be concentrated at specific locations where it can be fully protected and easily maintained.



Sinclair Pipe Line Company

Microwave radio helps Sinclair coordinate flow of crude oil and oil products over many states—even turns pumps on and off. 7 voice, 4 telemetering channels link Cushing, Oklahoma and East Chicago, Indiana. Another channel permits remote control of 16 VHF radio base stations along the line which provide communication between over 100 radio-equipped vehicles and any company office in the microwave system. System is capable of providing up to 12 additional channels as needed.

Are microwave circuits your answer, too?

It depends.

What kind of service do you provide, how do you do it?

Let's assume that instant control and coordination of many functions, over long distances, are vital to your needs. Then you *should* investigate microwave because it is dependable, economical, and inexpensive to add additional circuits.

The services shown here *need* dependable voice and signal circuits. One controls the flow of crude oil and oil products over many states. The other uses microwave to link electric power facilities throughout one state.

Both use G-E Microwave Equipment for efficiency and economy. For additional microwave information, write: *General Electric Co., Microwave Equipment, Sect. X19106, Electronics Park, Syracuse, N.Y.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

GUY STRAND HOLDER

Safe

Handling of Guy Strands and Conductors

- Safest, easiest, most economical method of handling strand.
- Once strand has been placed in holder it CANNOT get out of control.
- No assistant required at holder when strand length is drawn out.
- No wire bindings or tapings required to retain complete control.
- Ideal for handling large, high strength strand.
- Readily carried to location, or can be bracket mounted on truck.

For further information write for Bulletin PH11A

MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION

Branford, Connecticut

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich. In Canada: Line & Cable Accessories, Ltd., Toronto

AmerTran Reorganized

(*Continued from page* 140)

marketed under the AmerTran brand.

The new operation is being headed by William Zillger, vice president and general manager. AmerTran manufacturing will be supervised by John Shimansky, formerly works manager for the American Transformer Co. Over-all responsibility for planning and marketing is under the direction of Stanley L. Chaikind.

Okonite Foremen Inspect North Brunswick Plant

That people are an important part of any company's plans and programs was convincingly demonstrated recently by the Okonite Co, manufacturers of electric cable. Two groups of foremen and supervisors from the Wilkes-Barre, Pa., plant, accompanied by their wives, paid an official visit to Okonite's new North Brunswick, N. J., plant. The visit was in connection with company's forthcoming move from Wilkes-Barre and a concomitant expansion.

The purpose of the visits were (1) To give the men who will actually run the manufacturing operations an opportunity to inspect the new plant, also layout of newly purchased equipment, as well as equipment to be brought from Wilkes-Barre, and (2) to show them and their wives the surrounding area with its residential, educational and recreational facilities.

Okonite expects to begin some manufacturing operations by late 1956.

U. S. Copper Production

Copper production and stock in U. S. for August increased generally, according to a report of the Copper Institute, New York. Primary copper production totalled almost 90,860 tons, an increase of 6,070 tons over July production. August deliveries to fabricators was about 110,130 tons, up about 12,430 tons from July. Refined stocks at the end of August was 96,540 tons, the highest this year and some 8,500 tons more than in July. Refined production amounted to 122,108 tons in August, a decrease of about 3,290 tons from July, and the third drop from May's 145,740 tons.

STRONGER THAN THE PIN

In laboratory tests to determine the torsion strength of Kimble *Tempered* Glass Insulators, wood pins were sheared off, and lead-bushed threads stripped, with no failure of the Insulators. Cantilever tests using special alloy pins were discontinued at 10,000 lbs. with still no failure. Ultimate impact tests averaged 130 inch pounds!

Kimble *Tempered* Glass Insulators save installation time because it's never necessary to loosen for lineup with the conductor. Their great strength always allows another quarter-turn.

If it's on the pin, it's in service

Tests far in excess of A.I.E.E. standards have proved it impossible to puncture a Kimble *Tempered* Glass Insulator in air. Even lightning surges have failed to damage them. In the event of shattering due to severe mechanical shock, insulator disintegrates into small, non-sharp fragments. Trouble shooters can locate broken insulator—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

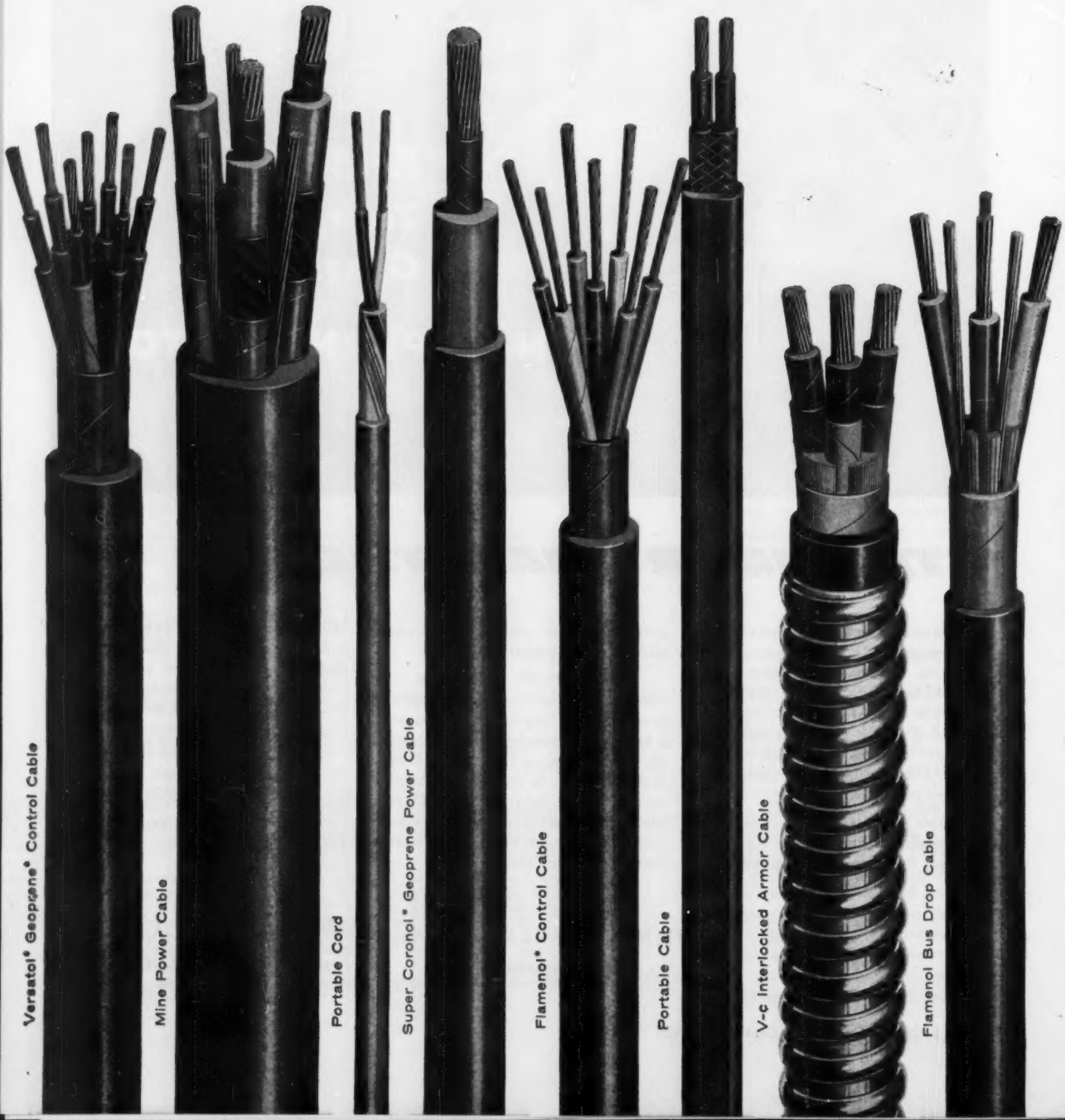
Why not see how *tempered* glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW-10, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES · TOLEDO 1, OHIO

More scope for selection

IN THE FULL LINE
OF GENERAL ELECTRIC CABLES



The General Electric line of hundreds of wires, cables, and cords covers just about every possible need. Typical of these are flame-resistant, heat-, moisture-, and weather-resistant types and special constructions to withstand vibration, the electrostatic effects of adjacent power cables—even the effects of atomic radiation. Thus, G-E engineers are never limited to one cable, cord, or wire for a given job but can suggest the most efficient and economical solution for the particular situation.

This is one of the important reasons why General Electric wire and cable engineers have been able to help many electrical contractors with their electrical expansion and modernization plans for industrial customers. Another reason is General Electric's knowledge of the requirements of other basic components of power distribution systems—transformers, load centers, switchgear, etc. — and the importance the right wire or cable plays in satisfactory system performance.

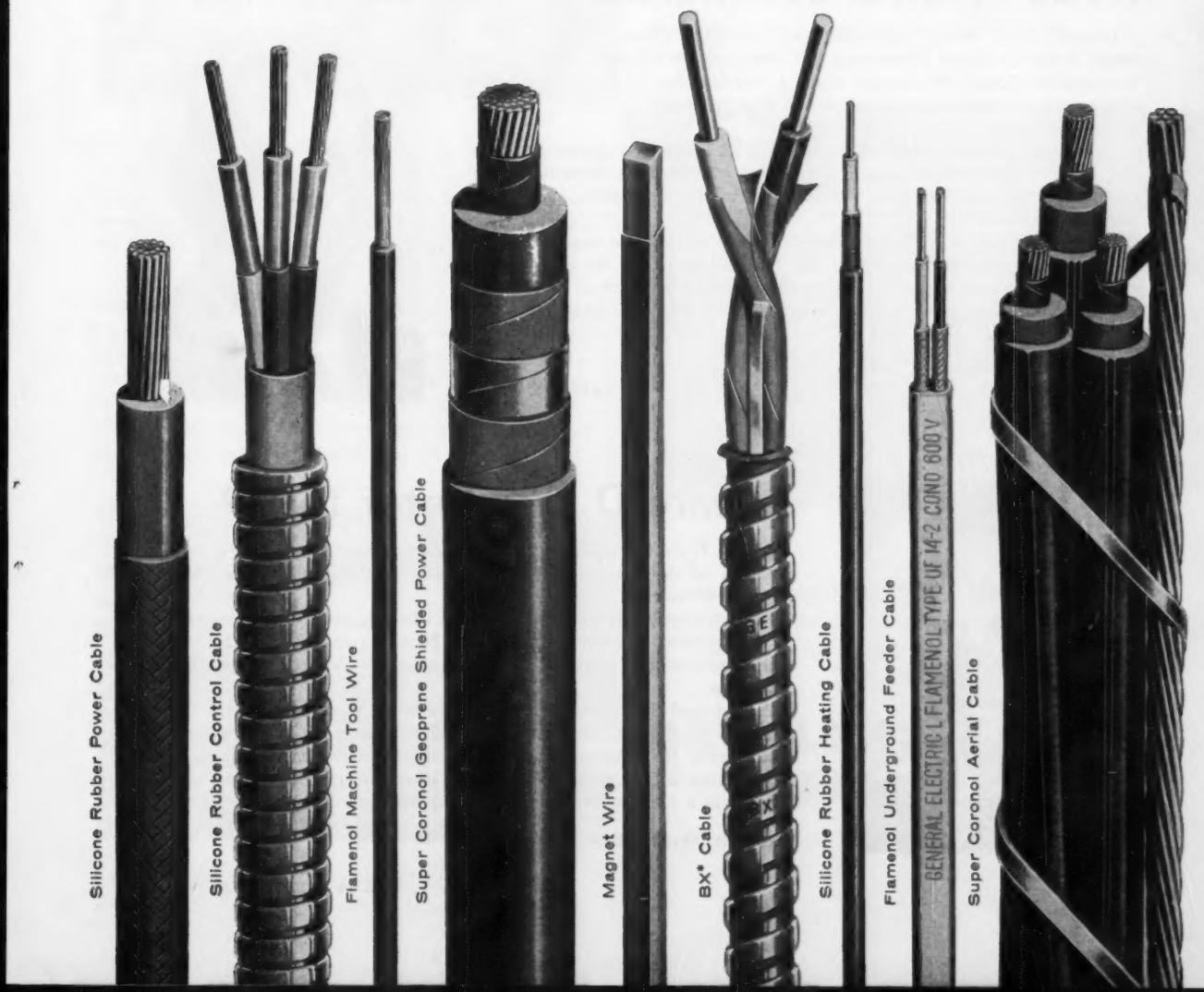
All this adds up to experience . . . the kind that can benefit you. Next time you have a cable selection problem it will pay to take advantage of General Electric's knowledge and experience.

For information on your specific wire and cable application or selection problem see the G-E wire and cable specialist in your locality or write to Section W183-1027, Wire and Cable Department, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC


Silicone Rubber Power Cable
Silicone Rubber Control Cable
Flamenol Machine Tool Wire
Super Coronol Geoprene Shielded Power Cable
Magnet Wire
BX* Cable
Silicone Rubber Heating Cable
Flamenol Underground Feeder Cable
GENERAL ELECTRIC FLAMENOL TYPE UF 14-2 COND 600 V
Super Coronol Aerial Cable

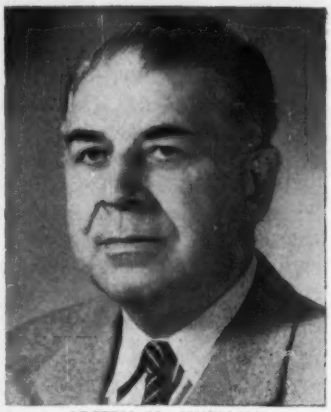
Lapp Elects Mills, Murnan to Executive Posts

BRENT MILLS

Brent Mills has been elected executive vice president and Joseph M. Murnan vice president in charge of manufacturing by Lapp Insulator Co, Inc.

Mills has served as vice president since 1950 and has been a director for 12 years. The new executive vice president, who has been with Lapp since the start of his business career, began by selling insulators in the Middle West. He subsequently advanced to secretary and sales manager before his vice presidential appointment.

Murnan, a director for 6 years, was first employed in the Lapp factory. He assumed positions of greater responsibility until he was made plant superintendent in 1937 and a director in 1950.



JOSEPH M. MURNAN

Redd Named Commercial VP for GE District

Carter L. Redd, district apparatus sales manager in Atlanta for the past 11 years, is newly elected commercial vice president for General Electric Co's Southeastern district. He succeeds Claud J. Hendon who, after ten years in the vice presidential post, remains as a consultant until his retirement becomes effective at the end of the year.

In his new capacity, Redd will direct regional customer relations activities and serve as company spokesman for 92 departments in a seven-state area comprising Georgia, Alabama, Mississippi, Florida, Tennessee, and North and South Carolina.

Redd joined GE in 1922 upon graduation with an electrical engineering degree from Virginia Polytechnic Institute. He was assigned to the Southeast in 1923, and aside from war-time service and a special assignment at Oak Ridge, Tenn., Atomic Energy Works, has been associated with the Apparatus Sales Division ever since.

CARTER L. REDD

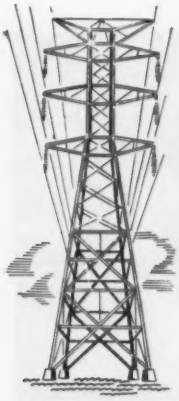
Square D Ups Peter to VP

Square D Co has announced the election of Wilber H. Peter, Jr, as a vice president of the company and division manager of the Electric Controller Division, Cleveland.

Peter, formerly division works manager, succeeds Alvin C. Dyer, who retires as vice president and division manager to become a consultant to the company on the application of electrical controls to steel mill and related heavy industry operations.

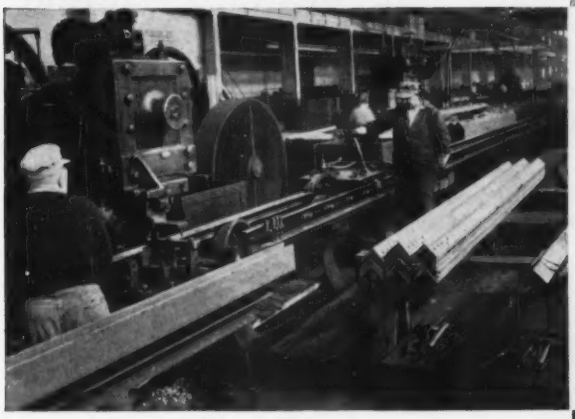
Peter joined the former Electric Controller & Manufacturing Co in 1937 as a sales trainee and later served as a field engineer in the Pittsburgh office for seven years. He subsequently assumed various production and personnel responsibilities in EC&M's Cleveland plant. When the firm merged into Square D last year as a division, he was named works manager.

WILBER H. PETER, JR



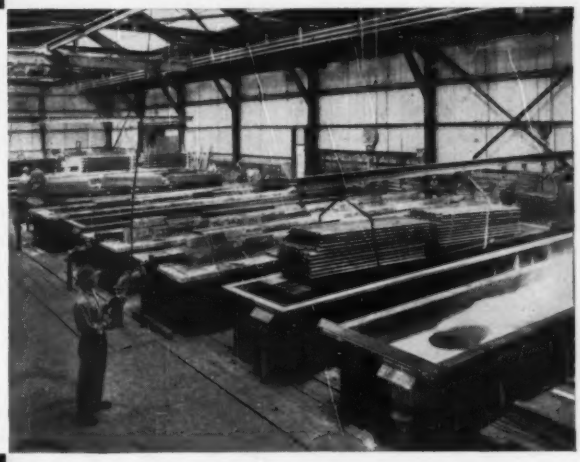
When Bethlehem gets the job . . .

SKILLED ENGINEERS plan production of your towers and switchyard structures. Their detail drawings assure accurate, efficient fabricating. They tell our shopmen exactly where to punch and shear . . . to within 1/32 inch! Takes good men and good tools to do this kind of job.



RACK PUNCHES (shown here) as well as tandem and cluster punches are among the *specialized* equipment necessary. Holes must be accurate in position and size—they can't be reamed after galvanizing. There's all the difference in the world between tower work and ordinary structural fabricating.

GALVANIZING protects the steel from corrosion. The pieces are thoroughly cleaned, pickled, immersed in an electrically controlled zinc bath, then quenched. We do our own galvanizing, of course. All three Bethlehem tower shops are equipped with the latest word in galvanizing facilities.



FINISHED STEEL is carefully sorted in the shipping yards. You receive each individual tower "package," including fasteners, ready for speedy erection in the field. Our tower-fabricating works at Leetsdale, Pa. (near Pittsburgh), South San Francisco, Calif., and Seattle, Wash. are strategically located to fill your tower and switchyard requirements. May we quote on your next job? Please contact the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

BETHLEHEM PACIFIC COAST STEEL CORPORATION, SAN FRANCISCO

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Colley Is Elected Executive VP

GEORGE S. COLLEY, JR

Newly elected executive vice president and director of Pacific Bechtel Corp, an affiliate of Bechtel Corp, is George S. Colley, Jr.

Colley, a senior vice president and director of Bechtel Corp, has been with the firm for more than 25 years and holds directorates and offices in several affiliated corporations.

In other major executive changes M. E. Harper and E. P. Kranzfelder were elected to Pacific Bechtel vice presidential posts. Harper, a 15-year Bechtel veteran, was recently elected vice president of Bechtel International Corp. Kranzfelder is presently in Korea as operations manager for three steam plants Pacific Bechtel recently completed for that country.

PERSONAL BRIEFS

S. J. Sickel, Kansas Gas & Electric Co's vice president of operations, has been elected a director of the company . . . Mississippi Power & Light Co has appointed **Charles DeKay** South Central Division engineer at Brookhaven. In a series of changes following **H. B. McGehee's** advancement from Central Division manager to assistant operating manager of the company, MP&L has named **J. W. Cavin** to succeed McGehee and promoted **W. T. Woods** from economic research director to Cavin's former post of Northern Division manager.

Savannah Electric & Power Co's new lighting engineer is **Wade B. Evans,** former commercial engineer in Georgia Power Co's Macon Division . . . Western Light & Telephone Co (Kans.) promotes **G. M. Crow** from Harper commercial manager to manager at Liberal. He replaces the late **A. E. Peter.**

Recently promoted by Virginia Electric & Power Co were **William R. Smith, Jr,** to distribution supervisor at Harrisonburg; **Horace G. Little,** to Albemarle district engineer; **John K. Taylor,** to assistant superintendent of service at Alexandria; **Stanley Ragone,** efficiency engineer at Portsmouth station; and **Elmo M. Sweeney, Jr,** efficiency engineer at Reeves Ave station.

Elwood A. Church has been named system planning engineer in Boston Edison Co's engineering and construction department. **Arthur B. Craig** becomes assistant superintendent of the department and continues as head of the service section. Also advanced were **Leslie J. Weed,** to electrical engineering section head; **Chester W. McGill,** who assumes full-time executive duties as assistant to engineering and construction department superintendent **George A. Orrok; Alfred F. Anderson,** to head of the department's distribution division; **Francis M. Staszesky,** assistant superintendent of the department; and **Thomas P. Monahan,** head of maintenance division, electrical section, production department.

Gerald F. Sheehy is new Minnesota Power & Light Co auditor. Succeeding him as machine accounting supervisor is **Reinhold H. Krause.**

New system rates analyst for Niagara Mohawk Power Corp is **Willard C. Percy,** former rate engineer . . . **Carroll E. Worlan,** former executive secretary of Iowa Utilities Association, joins the sales department of Iowa Power & Light Co to serve in the area development field.

West Penn Electric Co's recently named area development representative is **H. A. Ferris** of Monongahela Power Co, subsidiary. **Ross R. Talbott** replaces Ferris as Monongahela's Southern Division special representative and **E. L. Marks** succeeds Talbott as Grafton district manager. **William I. Matheny** becomes Shinnston district manager and **Jack Newton** advances to district representative at Paden City.

Westinghouse Electric Corp has designated **Brian J. Sturman, Jr,** assistant manager of the manufacturing and repair plant at Huntington Park, Calif.

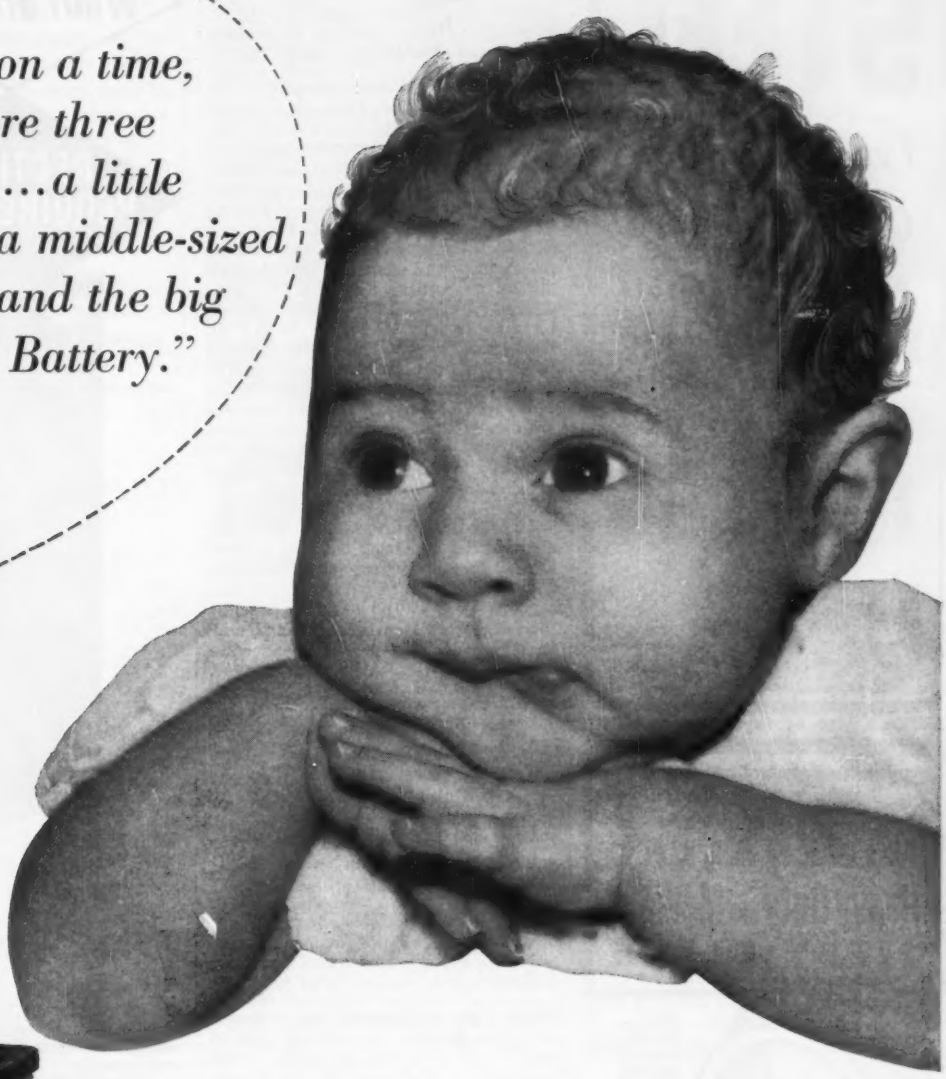
General Electric Co's power transformer department has announced the appointment of **Earl V. DeBlieux** as manager, engineering administration and personnel development; **Thomas C. Aitchison** consultant, engineering administration; and **John A. VanLund** manager, accessories and bushing engineering . . . Former manufacturing specialist in GE's Industrial Computer Section, **Raymond J. Barclay,** is new manager of that section . . . **George F. Young** has been appointed superintendent, power transformer and heavy tank fabrication in GE's power transformer department . . . **George M. Hartley,** new manager of marketing for the metallurgical products department, succeeds **J. E. Weldy,** recently appointed marketing consultant for GE's Marketing Services Division, New York . . . Detroit's metallurgical products department has named **Norman A. Matthews** research engineer.

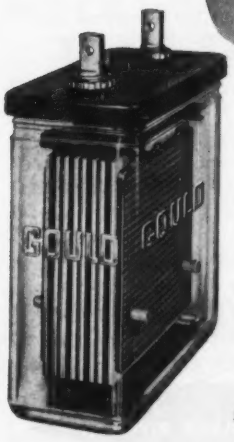
Southern Electric Corp, Chattanooga, has announced the appointments of **A. H. Tessmann** as executive vice president; **J. E. Jernigan,** vice president of purchasing; **H. H. Bullen,** vice president of sales; **C. W. Smith,** treasurer; **W. J. Hagan, III,** general manager of sales; and **L. W. Carpenter,** director of field sales.

Hotpoint Co has designated **James L. Rogers** manager of builder market development.

Association of Illinois Electric Co-operatives elected as its officers at the 15th annual convention: **F. J. Longmeyer** president, **William L. Stanford** vice president, and **Roy E. Horton** secretary-treasurer.

"Once upon a time, there were three batteries...a little battery, a middle-sized battery, and the big ***gould*** *Battery."*





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Two New Minerallac Quality Products Designed for Jobs Too Heavy for Standard Jiffy Clips

MINERALLAC Heavy Duty AND Medium JIFFY CLIPS

Made of heavier materials! Has exclusive inverted rib, that provides more strength at the bend of clip . . . and, of course, adds the benefits of famous "Snap On" feature!

In stock in Zinc-Plated Steel for Thin Wall or Rigid Conduit up to 6". (Hot Dipped Galvanized may be obtained on order) Can be substituted for malleable clips.

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MINERALLAC

SALES ASSIGNMENTS

COMPANY STAFFS

Allen-Bradley Co has designated D. W. A. Pleasanton export manager of its new export sales office in New York City.

Allis-Chalmers Manufacturing Co has named R. H. Cline, formerly manager of the Charlotte district, to succeed J. K. Keogh as manager of the Pittsburgh district of the company's Industries Group. Keogh continues as a special representative reporting to V. L. Spinney, Central Region manager. . . . E. R. Perry and Charles R. Isaacs have been appointed to the Southwest Region and Los Angeles district, respectively, of the Industries Group.

Babcock & Wilcox Co's Tubular Products Division has designated Anthony D. Zar as sales representative in charge of the Milwaukee district sales office. Succeeding him as manager of the general sales office, also in Milwaukee, is Kenneth W. Harris, previously assistant manager of the division's general sales office.

Westinghouse Electric Corp's Sturtevant Division has appointed Anthony J. Pandiscio as southwestern regional manager, with headquarters in St. Louis. He succeeds W. J. Oonk, now sales engineering specialist for the southwestern and midwestern region and the Cincinnati office of the central region. . . . Gordon W. Butler has been designated St. Louis sales manager for the company's Lamp Division.

REPRESENTATIVES

General Electric Co has designated Clark Transmission Co as authorized distributor of its gear motors and transmission equipment to serve the Newark, N. J., area.

J. F. Pritchard & Co has named Sears-Westall Co sales representative for eastern Missouri, southern Illinois, southern Indiana, and the western tip of Kentucky.

Radio Corp of America has appointed six representatives for its new line of special laboratory test apparatus: Hugh Marsland Co of Chicago, Ill., for Illinois, Indiana, Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, central Kentucky, and western Michigan; Technical Instruments, Inc, of Waltham, Mass., for Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and the major portion of New York state; Louis A. Garten and Associates of West Orange, N. J., for New York metropolitan area and Long Island, northern New Jersey, and northeastern Pennsylvania; M. E. Gerry & Co, Inc, of Upper Darby, Pa., for southern New Jersey, central and southeastern Pennsylvania, Maryland, Delaware, and the District of Columbia; Tiby Engineering Co of Detroit, Mich., for eastern Michigan and northwestern Ohio; and Electro Sales Associates of Euclid, Ohio, for western Pennsylvania, all but northwestern counties of Ohio, and adjacent counties in Kentucky and West Virginia.

What are YOUR RECTIFIER REQUIREMENTS

- **Selenium?**
- **Germanium?**
- **Silicon?**

You get all these *pluses* when you use Walker Rectifiers: low DC ripple — about 4% . . . low cost . . . long, efficient life . . . no maintenance. All Walker Rectifiers are designed and built to the highest standards, with the highest quality components.

With Walker Rectifiers you install them and forget them as far as maintenance or repair is concerned. Get full details on Walker Rectifiers — Selenium, Germanium or Silicon — write for complete details or engineering assistance.

NORMA-HOFFMANN The Walker DIVISION BEARINGS CORPORATION

THE WALKER DIVISION

NORMA-HOFFMANN BEARINGS CORPORATION

Stamford, Connecticut

4.16 Kv Does Job

(*Continued from page 57*)

remainder of the motors.

5. Running power factor of the boiler feed pump motors was 0.9 and the efficiency 0.95. Average running power factor of the other motors was 0.85 and the average efficiency 0.93.

6. Locked rotor impedance of the boiler feed pump motors was 0.16 per unit, that of the exciter motor 0.077 per unit, and that of all the other motors 0.167 per unit.

7. Normal auxiliary transformers were rated to carry the connected motor loads excluding spare motors.

8. For Systems 1 and 2 the kva rating of the start-up transformer equaled the total rating of two normal auxiliary transformers.

For System 4 the kva rating of the start-up transformer equalled 1.5 times the rating of the normal auxiliary transformer.

For System 5 the kva rating of the start-up transformer was twice the rating of the normal auxiliary transformer.

9. Motor-driven exciters were used on all units.

10. Where two units were serviced from the same start-up transformers, both units had the same steam conditions and the same kw rating.

11. Turbine rating referred to throughout the report is the maximum turbine capability.

12. High-voltage system was 230 kv.

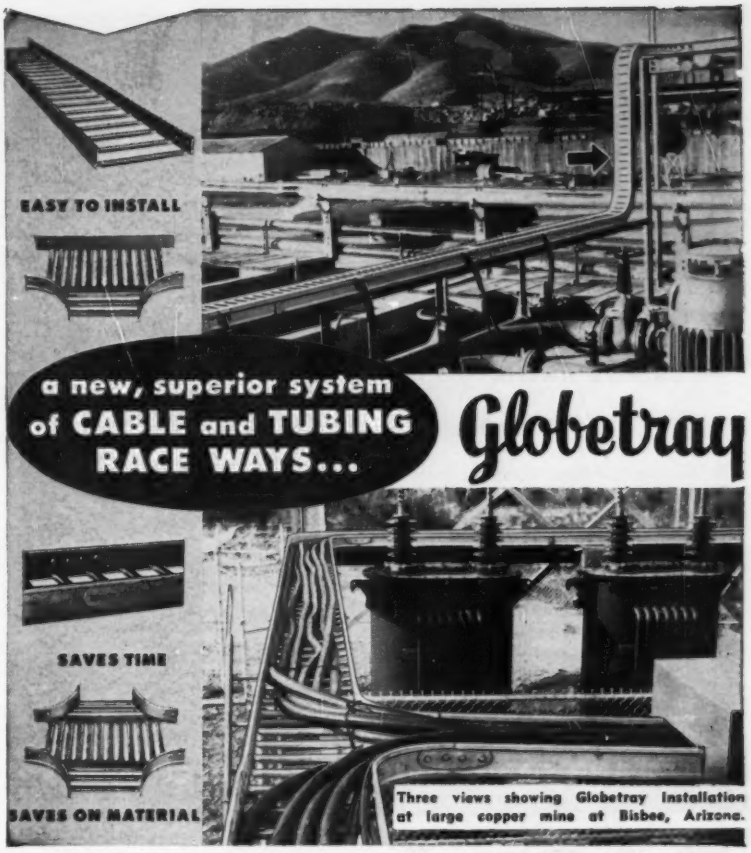
NEWS IN BRIEF

(*Continued from page 58*)

State, the State Power Authority, New York Electric & Gas Corp, and St. Lawrence Chamber of Commerce.

FPC denies Douglas County (Wash.) PUD's request for a rehearing of the license granted Chelan County PUD to build $200-million, 644,000-kw Rocky Reach Dam on the Columbia River. Request, based on Douglas County's plea for increased compensation for lost power potential at upstream Wells site, (which Douglas plans to develop) was refused on grounds that it contained no new facts or legal points . . . New Brunswick Electric Power Commission undertakes the **moving of houses** and building or

(*Continued on next page*)


EASY TO INSTALL
a new, superior system of CABLE and TUBING RACE WAYS...
Globetray
SAVES TIME
SAVES ON MATERIAL
Three views showing Globetray installation at large copper mine at Bisbee, Arizona.

A completely engineered system of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The universal splice plate joins all parts through the side channels only. All curved fittings are joined at the end of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

Comes in 6", 12", 18" and 24" widths, in standard 12' lengths to further speed up installation time. Cable way can be cut to length at any point – insides and bottom always smooth – all sections punched for easy installation – perfect fit at all times. Neat, clean and uniform in appearance.

Write for new complete catalog. Distributors in all principal cities. Contact the Grip-Strut distributor under "Conduits" in the classifed telephone directory.

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IN ONE PACKAGE FROM PLM

● Why waste time worrying with many materials, from many sources, for splices and terminations? PLM Unit Package Kits simplify planning and estimating...provide *complete* materials in *one* package for correctly designed splice or termination. Supplied for rubber, synthetic, VC or paper-insulated cable – metallic and non-metallic sheathed – for ratings through 23 kv. Write for catalog.

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Complete materials in one package for splicing

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- Non-metallic cable to armored cable
- Lead-covered cable to armored cable
- Single conductor cables to armored cable – or any combination of above.

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Armored Cable Terminators • Splicing and Terminating Kits • Conduit Ventilators

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PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

NEWS IN BRIEF

(*Continued from previous page*)

new ones out of reach of projected 135,000-hp St. John River development at Perth, New Brunswick.

Fairfax, Va., wins approval to construct a dam across Goose Creek in Loudoun County despite opposition from county board of supervisors and citizens residing near dam site. Objections, running from fears of flood and menacing mosquitos to impediments to navigation, were defeated by the commission which contended that the mosquitos "were more of the nuisance type" and that since the watercourse at the dam site is not navigable, the dam could not impede navigation.

Three Cumberland River (Tenn.) plants—Wolf Creek, Dale Hollow, and Center Hill—**generated a record 1,415,596,000 kwhr** in fiscal 1956, topping previous high of 1,412,432,000 kwhr in 1952. "Unusually dry weather in the fall of 1955 and extending through January 1956 prevented the power record's being broken by an even greater margin," said Col Eugene Stann, Nashville district engineer.

Snohomish County (Wash.) PUD and City of Everett plan **joint construction** of a dam on Sultan River east of Everett . . . **Canadian government has approved** $7-million project at Whitehorse Rapids, Yukon, by Northeast Power Commission. Power will be distributed by Yukon Electric Co.

STEAM

Cleveland Electric Illuminating Co has dedicated its $80-million, 660,000-kw Eastlake plant, already in operation. The 4-turbogenerator plant, which produces 1-kw of electricity from three-fourths of a pound of coal, has boilers that consume over 4,000 tons of fuel a day . . . **Commonwealth Edison Co** has asked city of Hammond (Ind.) to approve the filling of 79 acres of Lake Michigan to provide for future expansion of its State Line station located nearby. Plans include construction of dock and loading facilities at State Line, which serves both Edison and Northern Indiana Public Service Co.

Oklahoma Gas & Electric Co has dedicated its $20-million, 170,000-kw

plant on the Arkansas River near Muskogee . . . To insure future power supply in Toronto area, **Ontario Hydro-Electric Power Commission** plans test-boring of sites for possible steam generating station at the Lakeland.

Florida Power Corp has selected a site on Tampa Bay, St. Petersburg, for its proposed 120,000-kw, $20-million plant . . . Albuquerque area has been chosen by **Public Service Co of New Mexico** as the site for its projected North Station, which will have ultimate capacity of 350,000-kw. First unit will generate 44,000-kw.

MISCELLANEOUS

Central Power & Light Co has moved to aid Mexico in overcoming "chronic" power shortage by agreeing to sell the fast-growing city of Monterrey 15,000 to 20,000 kw of interruptible power. The imported power, to be transmitted from Falcon Dam to Monterrey over lines built by the Mexican government, must be stepped down from 138,000 v on CPL lines to 110,000 v for transmission on Mexican lines.

Solar furnace design and operation will be featured at two-day symposium in Phoenix, Jan 21-22, 1957, sponsored by Association for Applied Solar Energy, Stanford Research Institute, Arizona State College and University of Arizona . . . **Chile's power supply** is slated for a boost of 120,000 kw with American & Foreign Power's announcement of plans to invest about $60 million in plant and transmission facilities for power production to the country's principal provinces.

Cowlitz County PUD orders plans for construction of a $300,000 office building in Longview (Wash.) on an 18-acre tract it bought last year.

REA's, CO-OPS, & MUNICIPALITIES

TVA has paid Kentucky $490,454 in lieu of property taxes, topping last year's figure of $319,000. This payment is in addition to those made directly by TVA to the state's cities and counties . . . Rural Electrification Administration has loaned $255,000 to **Rusk County Electric Cooperative,** Henderson, Tex., for construction of 75 mi of distribution line to serve 720 new members and for general system improvements.

This is a sales manager?

That's right. Joe Warren is accustomed to having grease in his eyebrows. If getting a job out on time means Joe and *everyone* else at Royal pitching in on the production line—that's where you'll find them.

In order to give *every* customer the "Royal Treatment," we keep our operations flexible — gearing them to each individual job and *when it's wanted.*

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Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

Rescued from

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G-E Service Shop

Get your obsolete distribution transformers back on the pole again—as good as new! Just call your local G-E Service Shop. We'll rebuild them ...uprate them 40% or more ...and return them with new-transformer warranties. There are 52 G-E Service Shops throughout the country—one near you. 431-31

Progress Is Our Most Important Product

GENERAL ELECTRIC

Wiegand Starts Heat Work Shop Sessions for Utilities

A series of work shop sessions on residential heating applications and sales for utility personnel have been started by Edwin L. Wiegand Co. First of the one-day sessions was held at Wiegand's Pitsburgh (Pa.), headquarters Sept. 27. They will be continued at three-week intervals. Attendance is limited to 75 persons per session.

Among the subjects covered, according to C. F. Kreiser, Wiegand's general sales manager, are: (1) Calculation of heat losses for electrically heated home; (2) Selection and location of heaters and controls; (3) Calculation of annual electrical bill; (4) Present and future market for electric home heating; (5) Heating homes electrically is better living electrically; and (5) The utility's role in developing the true all-electric home with electric heating.

"Look" Broadens Its 1957 AW Contest

Look Magazine has set up prizes for two utility divisions in its third annual contest for adequate wiring promotion. Separate categories have been announced for electric companies with more than 250,000 meters and those with less than 250,000.

In the utility division, prizes are based on development of consumer acceptance of the need for adequate wiring. The awards cover distributor, contractor and appliance dealer categories too. They'll be presented at the National Adequate Wiring Bureau's annual conference in Chicago on Feb. 28, 1957.

Editorially, the magazine will bolster consumer interest with a two-and-a-half page AW spread in the Oct. 16 issue (on newsstands Oct. 2). It asks "Are You a Victim of America's Wiring Mix-Up?" Exaggerated cartoons reproduced in five colors depict 10 common symptoms of faulty wiring. The half-page section lists appliances which can be used with 30, 60 and 100 amp service, and flags "Housepower" and "LBE" slogans.

Available in reprint form, the spread is described as natural for home show give-aways.

Deadline for all entries is Feb. 1, 1957. They should be mailed to Adequate Wiring Competition, Look Magazine, 488 Madison Ave., New York 22, N. Y.

INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE, IND.

Signs along the lines of *Crapo* GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance ... insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!

INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

sectional view of 2-Way "Hex" Shank

NEW IRWIN 2-WAY "Hex" Shank Wood Bit

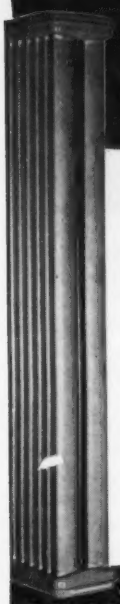
fits both bit braces and electric drills

Use with hand brace as it comes. Order *without taper square shank*, or use hacksaw to convert to 2-Way "Hex" Shank for use in both hand braces and electric drills. It chucks perfectly—no wobble. Fast boring action speeds work. 2-way usage cuts inventory costs. Longer life cuts replacement costs. Hardened full length. Sizes 4/16 to 17/16". Call your mill supply distributor or hardware wholesaler for complete details.

IRWIN
Wilmington, Ohio
HEX SHANK WOOD BITS

Specify

SHAW-PERKINS COOLING RADIATORS



. . . design standard for the transformer industry

Built by specialists, properly designed throughout to give *any make of transformer* full advantages of economical, dependable thermo-siphon principle of self-cooling. Valves, flanges, elbows, available. Transformer tanks built to customer's design.

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S&S SHORTS

Bulb Contest Set

Six utilities will win "Nela Park Awards" for most successful, creative and imaginative bulb sales campaigns in first of annual contests. Sponsored by General Electric Co, it will be open to three groups of contestants: Private companies with 100,000 or less customers, those with more than 100,000, and municipals and co-ops. They will compete in two categories for the plaque awards: Those which retail bulbs and those which don't. Contest closes May 31, 1957. Mail entries to Nela Park Award Committee, General Electric Lighting Institute, Nela Park, Cleveland 12, Ohio.

Lighting Layouts While U Wait

A "plan-it-yourself" lighting layout kit is now available for selling store office and factory lighting jobs. Kit contains graph paper, cardboard cutouts of fixtures, lighting estimator, and other aids to help utility salesmen, contractors, and distributors quickly calculate and set up planned lighting jobs. Price is $1.75 each. Order from General Electric Co, Dept. WE-7, Nela Park, Cleveland 12, Ohio.

Lighter Homework Booklet Out

Two-color, eight-page booklet on lighting for home study has been published by Better Light Better Sight Bureau. Called "How to Make Homework Lighter," it is informal, shows how lighting can be improved without extensive room changes. It is revamped and reworded version of booklet previously published under same title. Price is $4 per hundred on less than 1,000 copies; $35 per thousand on quantities of 1,000 and over. Order Form B-563, BLBS Bureau, 420 Lexington Ave, New York 17, N. Y.

COMPETITOR'S CORNER

Fall Gas Drive Set

New promotion plugging "Seven Ways Gas Is Better" hits national magazines this fall in drive by 11 gas equipment manufacturers to jack up gas appliance sales. One report says gas ranges and refrigerators are selling below their 1941 levels despite a 50% rise in number of homes getting gas service over that period.

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.

1810 Columbia Avenue • Rockford, Illinois

MODERN BUSINESS

AND MODERN SCHOOLS

NEED EACH OTHER MORE THAN EVER!

This has been a great year! America is building and replacing and thus moving faster than ever before.

Only one thing. Will the labor market keep pace?

That's where schools are important. If your company isn't helping community groups to get modern schools, it's not apt to get the skilled people it needs. Self interest, civic spirit, or both, you should make schools your business, too.

PUBLIC SERVICE ADVERTISING COUNCIL

Want to find out how to help in *your* community?
Get specific information by writing:
Better Schools, 9 East 40th Street, New York, N. Y.

Appliance Repair

GE sets up minimum service standards for its appliance dealers to reassure potential buyers

A nation-wide program of minimum service standards for household appliances has been set up by General Electric Co for dealers and distributors of its products. Now a potential appliance buyer can be reassured before the sale that:

- An authorized GE service man will knock on his door within six hours after a call if the situation involves serious inconvenience or possible property loss or damage. Other calls will be answered by the second working day after the service request is made. A leeway of an extra day is allowed during peak service seasons, but these must not amount to more than four weeks a year.
- Distributors will stock all operating parts for which there are four or more calls a year. This will avoid service delays. When a dealer orders a part in stock, it must be shipped on or before the first working day following receipt of the order. Out-of-stock parts must be ordered by wire or phone from GE's parts warehouse, and shipped by air mail or air express.
- Service men are being trained in special programs conducted by GE at its Louisville, Ky., plant to assure technical proficiency in appliance repair. Distributors will conduct similar courses for their dealers' service men at least once a year on each product line. Supplementary training will be provided as needed—especially with respect to new models of major appliances.

Outmoded Units Retired

Dismantling of four old generating units at San Antonio (Tex.) City Public Service Board's Mission Road Plant has been scheduled to precede the construction of the plant's new 100,000-kw unit, to be constructed at a cost of about $11 million. The smallest unit, installed in 1917, is 5,000 kw; the largest, installed in 1923, is 12,500 kw. Completion of the new unit in 1958 will bring system's total generating capacity to 448,000 kw.

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant | Civil Service Opportunities | Employment Agencies
Positions Wanted | Selling Opportunities Wanted | Employment Services
Part Time Work | Selling Opportunities Offered | Labor Bureaus

DISPLAYED —RATES— UNDISPLAYED

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to Classified Advertising Div. ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

OPPORTUNITIES
(in the field of measurements and testing)
FOR EXPERIENCED ELECTRICAL ENGINEERS AND E. E. GRADUATES

Small, well-established, employee-owned company, offering usual benefits plus potential profit-sharing and stock ownership.

Testing • Analyses • Inspection • Calibration • Evaluation

Interesting and important assignments covering broad range of testing, engineering analyses and inspection in electrical, electro-mechanical and environmental fields on all kinds of electrical materials, instruments, apparatus and equipment. High order of personal responsibility in work and client relationships. Also openings for engineers and specialists experienced in watthour meter and instrument testing and calibration; component evaluation; electrical appliances; air-conditioners; high-voltage cable.

In-Plant Work

Openings for engineers and specialists familiar with in-plant cable testing and inspection, instrument and test apparatus checking and calibration; also in-plant audits of inspection; quality control, and specification compliance procedures.

ETL

Please send resumé of education and experience, stating age and salary requirements, to

Gordon Thompson, Chief Engineer
Electrical Testing Laboratories, Inc.
2 East End Avenue, New York 21, N. Y.
Telephone BUtterfield 8-2600

at your fingertips!

. . . a full year's editorial coverage of the electric power industry!

You'll appreciate these attractive, businesslike files to make the year's copies of Electrical World a functional, permanent part of your business or home library. With the indexes bound into the issues twice annually they'll provide instant access to the nearly 8,000 editorial articles published each year. Just three Jesse Jones files, especially designed for Electrical World, protect a year's issues against soil, loss, wear. Copies are instantly removed for use—no wires to fuss with.

Each file is sturdily made (supports 150 lbs.) with red and black Kivar cover (closely resembles leather), lettered in 16k gold. Shipment can be made promptly at the special price of all three files for $7.00, postpaid. And don't forget—SATISFACTION UNCONDITIONALLY GUARANTEED OR YOUR MONEY BACK.

Jesse Jones Box Corp., Dept. EW
PO Box 5120
Philadelphia 41, Penna.

Please send postpaid....Electrical World files, for which I enclose $..... Or please bill me ( ).

Name .....

Address .....

City .....State .....

IF

You are unhappy in your present job . . .

IF

You are an electrical engineer or a mechanical engineer who has had some experience in electrical transmission or distribution . . .

IF

You are 25 to 35 years of age . . .

IF

You are seeking a real opportunity in the Sales Engineering field . . .

IF

You enjoy moderate travel in a localized area . . .

WE WOULD LIKE TO TALK TO YOU

We are a leading manufacturer of electrical transmission and distribution equipment. Our expanding business requires the attention of several additional young Sales Engineers to whom we will furnish a better-than-average automobile, salary, bonus, profit-sharing-trust. Liberal vacation and hospitalization plan.

WRITE TODAY IN CONFIDENCE

E. W. WILLIAMS, VICE PRES.,
Marketing & Sales

LINE MATERIAL COMPANY
MILWAUKEE 1, WISCONSIN

SR. ELECTRICAL ENGINEER

Foreign Employment

For responsible staff position which involves planning and staff engineering of new electrical power generation plants utilizing steam or gas combustion turbines and related facilities for major oil installation in Saudi Arabia.

Must be a graduate electrical engineer with proven supervisory ability with minimum ten years' experience in planning, design and study of utilities systems, power generation, transmission, distribution and related work. Minimum salary $1000 monthly plus allowances and generous benefits.

Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 180

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

ENGINEERING - CONSTRUCTION FIRM
NEEDS AN

ELECTRIC UTILITY EXECUTIVE

A large engineering and construction firm in Eastern Penna. is looking for a man who has been, or is now, engaged by an electric utility company in the capacity of senior or junior executive.

His primary duty will be that of contacting executives and officials in the Utility field to promote relations and solicit inquiries for engineering and construction services in connection with power plant expansion programs. Applicants should be free to travel and have high order of personal responsibility in work and client relationships. Salary open.

Write outlining personal history and work experience. Please include telephone number.

P-3043—Electrical World
Classified Adv. Div.,
P.O. Box 12, New York 36, N. Y.

ELECTRICAL ENGINEER

TRANSMISSION SYSTEM DESIGN

Prefer 40-55 years of age. Extensive design experience on transmission lines and large substations up to 230 KV. Consulting engineering and large electric utility background highly desirable. System planning, construction and operation, and industrial plant design helpful. Supervisory experience with professionally trained personnel and proven ability in employee and client relations essential. Staff position in Home Office. Some travel. Exceptional opportunity with progressive firm. Liberal employee benefits including insurance and retirement plan.

Please write fully to

SVERDRUP & PARCEL, INC.
915 Olive Street
St. Louis 1, Mo.

Send Resume to
Manager of Employment & Placement
Industrial Relations Division

BECHTEL

CORPORATION

220 Bush Street

San Francisco 4, Calif.

For an immediate personal interview you may phone:

Paul Keating
Plaza 7-4400, New York City

Joe Braddick
Fairfax 3-2401, Houston, Texas

Bill Milligan
Tucker 1549, Los Angeles, Calif.

Don Palmer
Douglas 2-4032, San Francisco, Calif.

Cleveland Manufacturers Agent-Sales Engineer, 20 years experience contacting electric utilities, contractors, distributors, large industrials, in northern Ohio; wants 1 or 2 hi-grade distribution equipment lines. Address
RA-3091, Electrical World,
520 No. Michigan Ave., Chicago 11, Ill.

Don't forget the

Box Number

WHEN answering the classified advertisements in this magazine, don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

DESIGN ENGINEERS
ELECTRICAL CABLE

In New Jersey—positions with large insulated wire and cable manufacturer for engineers up to 35 years old with 5 to 7 years experience. Experience in design of rubber and paper insulated cables, high voltage cables, etc. Permanent positions. Salary commensurate with experience. Write stating age, education, experience and salary desired.

Address

P-2939, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Accountant for small utility. Must be familiar with Pennsylvania Commission requirements for "B" Company. State qualifications, salary expected, and when available. P-2886, Electrical World.

Electrical Engineer with M. S. or B. S. and up to 5 years experience. Major oil company. To work as Staff Engineer in Production Department. Includes various Electrical Engineering Studies especially corrosion and oil field electrification problems. Replies confidential. Please submit resume of background and experience to The California Co., 800 California Bldg., New Orleans, La.

EMPLOYMENT SERVICES

Salaried Personnel, $5,000-$30,000. This Confidential service established 1920, is geared to needs of high grade men who seek a change of connections under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, P. O. Box 674, Manchester, Vermont.

Salaried Positions $5,000 to $35,000. We offer the original personal employment service (esablished 46 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 558 Brisbane Bldg., Buffalo, N. Y.

POSITIONS WANTED

Distribution Engineer, age thirty-six with nine years experience desires position with Public Utility. PW-2648, Electrical World.

Power Engineer—eleven years experience in operation and maintenance of modern hi-pressure central stations and industrial power plants. Thirty years old, married, seeks responsible position in domestic or foreign service. Presently located in South America, will be available in sixty days. PW-2934, Electrical World.

BOOKS AND PERIODICALS

A.I.E.E. Transactions wanted to buy for cash and other technical and scientific periodicals. E. W. Ashley, 27 E. 21, N.Y.C. (10)

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4764) will be received at Denver, Colorado, until November 6, 1956, for furnishing one 75,000/100,000/125,000-kva, 220/161-kv, 3-phase, outdoor, triple rated autotransformer, having a 13.8-kv, 9,000/12,000/15,000-kva (external load) tertiary winding for Sioux City Substation, Missouri River Basin Project, South Dakota. Delivery is desired within 360 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

WANTED

ANYTHING within reason that is wanted in the field served by Electrical World, can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES · EQUIPMENT - USED or RESALE

UNDISPLAYED —RATES— DISPLAYED

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches —to a page. EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send NEW ADVERTISING to Classified Advertising, P. O. Box 12, N. Y. 36, N. Y.

FOR SALE

5—OIL CIRCUIT BREAKERS

Whse. late type, outdoor type, De-Ion Grid, T.P.S.T., Rated 161000 V., 1200 amps.; 60 cy., 3 ph., Type GO-3, Interr. Duty 1,500,000 KVA.

Fully complete—Cond. like new.

Price and further inf. upon request.

PHILADELPHIA TRANSFORMER CO.
BOX 566 DALTON, PA.

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—

- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus

Branch Office:
Houston—Walnut 3-4580
FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL WIRE and CABLE CO.
2929 N. Pauline St. Chicago 13, Ill.
EAstgate 7-4777 Code: UNIWIRE

TRANSFORMERS

FOR SALE

3—1000 KVA Mol 11500-2400/4160Y
3—1000 KVA Mol 13200-2400/4160Y
3— 500 KVA W-H 33000-2400/4160Y
3— 500 KVA G-E 22000-2300/4000Y
3— 500 KVA G-E 13200-240/4160Y
3— 333 KVA A-Ch 14400/14100/13800/13500/13200-240/480
8— 250 KVA G-E8 Ditto
3— 167 KVA W-H Ditto
3— 167 KVA Mol Ditto
6— 250 KVA W-H 22000-7200/12470Y
3— 200 KVA Mol 7200/12470Y-2400/4160Y
4— 100 KVA A-Ch 33000-7200/12470Y

Many othe items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

Surplus Thermal Demand Wattmeters
SINGLE AND POLYPHASE
GOOD CONDITION

Write for Description and Prices

Duke Power Co. Charlotte, N. C.

SUBSTATION TRANSFORMERS

FOR SALE

2—General Electric Unit Substation transformers, 1500 KVA, Type OA/TU (1725 KVA—Type OA/FA) three phase, 60 cycle, 34,400 volt delta to 2520 volt delta, Form DM, Serial Nos. B359478-9. Four 2½% rated KVA taps at 36,200, 35,300, 33,500 and 32,600 manual no-load tap changer.

In service on electric distribution system since 1951. Excellent condition. Available about December 1, 1956. Write, wire or phone.

VILLAGE OF ARCADE
Municipal Electric Dept.
LUKE F. SHARON
Superintendent of Public Works
ARCADE, NEW YORK

FOR SALE

Allis Chalmers Synchronous Condenser

7500 KVA Lagging 15000 KVA Leading, 12500 Volts 3 Phase, 60 cycle.

EVEREADY SUPPLY CO., Inc.
803-5 Housatonic Ave., Bridgeport 4, Conn.

If there is anything you want
that other readers can supply
OR . . . something you don't want—
that other readers can use—
Advertise it in the
SEARCHLIGHT SECTION

LARGE POWER EQUIPMENT
Prompt Stock Shipment
REBUILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?
BELYEA COMPANY INC.
31 Howell St. Jersey City, N. J.

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
EBASCO SERVICES INCORPORATED
APPARATUS EXCHANGE Two Rector St., New York 6, N. Y.

MEETINGS CALENDAR

OCTOBER

• **Pennsylvania Electric Association**—System Planning Committee, Skytop Lodge, Skytop, Pa., Oct. 1-2; Electric Equipment Committee, Arlington Hotel, Binghamton, N. Y., Oct. 4-5; Hydraulic Power Committee, Mountain View Hotel, Greensburg, Pa., Oct. 4-5; Systems Operation Committee, Penn Alto Hotel, Altoona, Pa., Oct. 10-11; Meter Committee, Split Rock Lodge, White Haven, Pa., Oct. 18-19; Prime Movers, Garden City Hotel, Garden City, N. Y., Oct. 18-19; Communications Committee Meeting, Fort Stanwix Hotel, Johnstown, Pa., Oct. 22-23; Relay Committee Meeting, Hotel Robert Treat, Newark, N. J., Oct. 25-26.

Edison Electric Institute—Prime Movers Committee, Radisson Hotel, Minneapolis, Minn., Oct. 1-3; Area Development Committee Meeting, Oct. 3, and Area Development Committee Workshop, Radisson Hotel, Minneapolis, Minn., Oct. 4-5; Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio, Oct. 15-16; Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y., Oct. 18-19.

Illinois Institute of Technology—12th Annual National Electronics Conference, sponsored jointly by American Institute of Electrical Engineers, Institute of Radio-Engineers, University of Illinois, and Northwestern University, Hotel Sherman, Chicago, Ill., Oct. 1-3.

National Electronics Conference—12th Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill., Oct. 1-3.

• **American Institute of Electrical Engineers**—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5; Conference on Magnetism and Magnetic Materials, Hotel Statler, Boston, Mass., Oct. 16-18; Electrification of Machine Tools Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, Oct. 22-24; Farm Electrification Conference, Hotel Peabody, Memphis, Tennessee, October 29-31.

Canadian Electrical Manufacturers' Association—12th Annual Meeting, Sheraton Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 3-5.

Indiana Electrical Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 3-5.

Missouri Valley Electric Association—Sales and Rural Conference, Hotel President, Kansas City, Mo., Oct. 3-5.

Southeastern Electrical Exchange—Sales Conference, Tides Hotel & Bath Club, St. Petersburg, Fla., Oct. 3-5; Accounting Meeting, Hotel Seville, Miami, Fla., Oct. 10-11.

Standards Engineers Society—Fifth Annual Meeting, Hotel Willard, Washington, D. C., Oct. 3-5.

International Association of Electric Leagues—Sheraton-Cadillac Hotel, Detroit, Mich., Oct. 3-6.

Rocky Mountain Electrical League—Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 7-10.

Interstate Power Club—Hotel Martinique, New York, New York, Oct. 8.

American Society of Mechanical Engineers—Lubrication Conference, sponsored jointly with American Society of Lubrication Engineers, Chalfonte-Haddon Hall, Atlantic City, N. J., Oct. 8-10.

• **American Welding Society**—National Fall Meeting, Hotel Cleveland, Cleveland, Ohio, Oct. 8-12.

Great Lakes Power Club—Fall Meeting, Durant Hotel, Flint, Michigan, Oct. 11-12.

Inter-Industry Farm Electric Utilization Council — National Power Use Workshop, Milwaukee Auditorium, Milwaukee, Wis., Oct. 15-16.

Iowa Utilities Association—Annual Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 15-16.

Michigan Municipal Utilities Association—Park Place Hotel, Traverse City, Mich., Oct. 17-19.

• **Wisconsin Utilities Association**—Annual Convention of Electric & Gas and Operating & Sales Sections, Schroeder Hotel, Milwaukee, Wis., Oct. 17-19.

American Standards Association—38th Annual Meeting and 7th National Conference on Standards, Hotel Roosevelt, New York, Oct. 22-24.

University of Texas—Ninth Power Distribution Conference, University Batts Auditorium, Austin, Tex., Oct. 22-24.

National Safety Council—44th National Safety Congress & Exposition, Chicago, Illinois, Oct. 22-26.

National Association of Corrosion Engineers—South Central Region Meeting, M & M Building, Houston, Texas, October 23-26.

• **Oklahoma Utilities Association**—Electric Light & Power Division, Western District, Chickasha, Okla., Oct. 25; Eastern District, Poteau, Okla., Oct. 26.

Northwest Public Power Association—Power Use Section, Franklin PUD Auditorium, Pasco, Wash., Oct. 25-26.

Montana State Rural Electric Cooperative Association—Annual Meeting, Lewiston, Mont., Oct. 29-31.

• **Industrial Management Society**—Hotel Sherman, Chicago, Ill., Oct. 31-Nov. 2.

NOVEMBER

• **Pennsylvania Electric Association**—Transmission and Distribution, Shenango Inn, Sharon, Pa., Nov. 1-2.

National Rural Electrification Cooperative—Region Nine Annual Meeting, Davenport Hotel, Spokane, Washington, November 12-13.

National Electrical Manufacturers Association—Annual Meeting, Traymore Hotel, Atlantic City, New Jersey, November 12-16.

• **Pacific Coast Electrical Association, Inc**—Administrative Services Section, Hotel Biltmore, Santa Barbara, Calif., Nov. 14-15.

Edison Electric Institute—Industrial Relations Committee, EEI Headquarters, New York, N. Y., Nov. 15; Accident Prevention Committee, Statler Hotel, Hartford, Connecticut, November 26-28.

American Society of Refrigerating Engineers—43rd Semi-annual Meeting, Hotel Statler, Boston, Massachusetts, November 25-28.

American Society of Mechanical Engineers—22nd National Exposition of Power and Mechanical Engineering, Coliseum, New York, N. Y., Nov. 25-30.

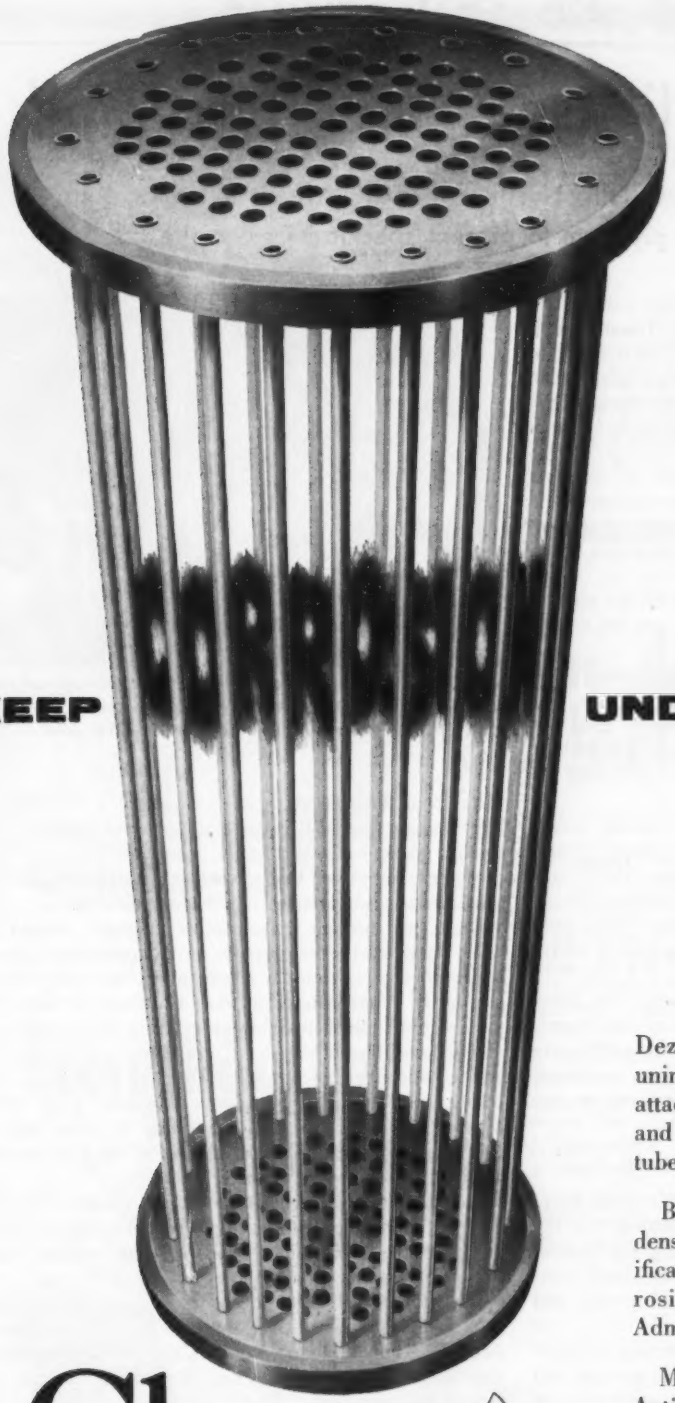
Great Lakes Conference of Railroad and Utilities Commissioners—First Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va., Nov. 29-30.

DECEMBER

Institute of Radio Engineers—2nd Instrumentation Conference, Biltmore Hotel, Atlanta, Ga., Dec. 5-7.

Edison Electric Institute-American Gas Association—1957 Accounting Conference Planning Committee, EEI-AGA Headquarters, New York, N. Y., Dec. 6-7.

• Additions this week



KEEP CORROSION UNDER CONTROL...

with CHASE® Antimonial Admiralty Condenser Tubes!

Dezincification can make short work of uninhibited condenser tubes! It insidiously attacks the metal surface, dissolving the zinc and leaving porous copper behind until the tube wall is completely penetrated.

But Chase Antimonial Admiralty condenser tube is practically immune to dezincification! What's more, it retains *all* the corrosion resistant properties of ordinary Admiralty.

More than 100 million pounds of Chase Antimonial Admiralty tube have been installed to successfully combat dezincification, since Chase introduced this remarkable alloy in 1935. It may be just the alloy for you, too! Write for complete details.

Chase®
BRASS & COPPER CO.
SUBSIDIARY OF KENNECOTT COPPER CORPORATION • WATERBURY 20, CONNECTICUT

The Nation's Headquarters for Brass, Copper and Stainless Steel

Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

Vennard: Public Isn't Being Informed

EEI's managing director tells Northwest EL&P Association that the industry should form a program to present specific issues to the public

Edwin Vennard warned the electric utility industry recently that the public isn't being informed. The managing director of Edison Electric Institute urged the industry to combat this void of information by forming a program to present specific power issues to the public. He spoke at the 49th annual meeting of the Northwest Electric Light & Power Association at Gearhart, Ore.

Vennard said utilities can and should strive for the same high levels in public relations as they have achieved in engineering, financing, and sales. The industry's attention, he declared, should be directed to these categories which foster government control of utilities:

1. The public believes it is constitutional for the government to produce power at projects which are not related to constitutional functions.

2. The federal government finances power projects at no interest or at less than free market interest rates.

3. Government operation of power projects does not return taxes on the same basis as does private operation.

4. Priority and preference provisions contained in federal law are not known to the public.

Vennard offered that the industry can change public opinion regarding these categories by applying present public relations know-how. Public relations efforts over the past 20 years have paid off, he stated. While 50% of the public favored socialized power in the 1930's, only 34% is so inclined today. Only 10% favors federal operation, he added.

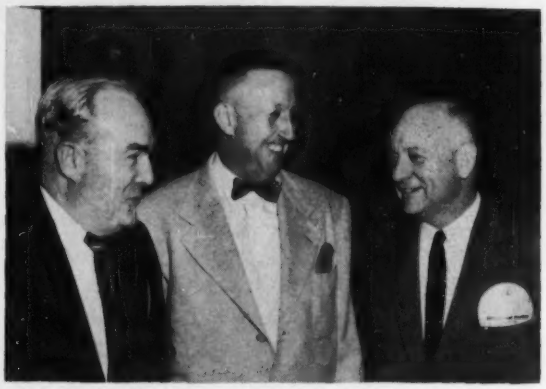
Surveys based on factual questions show that every unfriendly opinion can be traced to lack of specific knowledge. For instance, he said, only 5% of the public ever heard of preference. Yet, after the facts were explained, 75% of those polled stated they were opposed to preference on the basis of its being unfair.

The Problem Comes Home to the Industry

Thus, continued Vennard, the problem has come home to the industry—the public isn't being informed. Let the industry set down a program of presenting the specific issues to the public. Under such a program, local companies should work in concert with regional groups, and they in turn with national associations.

First in the program should be the informing of company employees on company time, in small groups, and under trained discussion leaders. Secondly, some man of consequence from each company should make personal calls on all opinion-forming leaders in the community. These steps will consume time and effort, but if the industry acts now, he said, the problem can be solved.

"Our Association must become the rallying point for all who believe in private or investor-owned utilities," said R. C. Setterstrom, outgoing Association president. "We must enlist the help of every other industry which believes in the free enterprise system. It is our duty to alert these groups to the potential danger of non-taxpaying or low taxpaying public utility operations."



NEW PRESIDENT of the Association, E. M. Naughton (left), and outgoing president R. C. Setterstrom (center), chat with J. T. Kimball, the newly elected first vice president

Setterstrom offered that top executives of private utilities have the necessary talent to convince these groups. The Association, through its executive manager, should become familiar with the purposes of opinion-forming groups and such organizations as conservation, fish and wildlife, and labor. The Association should attempt to utilize the top-executive talent available as speakers for regional and national meetings of the above groups and associations.

The future role of public relations in the industry was emphasized by E. M. Naughton, president, Utah Power & Light Co. He observed that there is more hope at this time for the combination of three of the four national associations serving the industry.

He defined these groups as Edison Electric Institute, Electric Companies Advertising Program, Electric Companies Public Information Program, and National Association of Electric Companies.

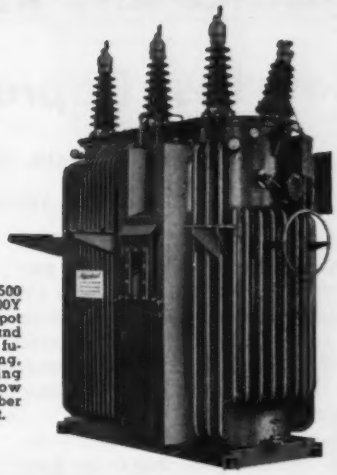
Elected as officers of the Association for the next year were E. M. Naughton, Utah Power & Light Co, president; John T. Kimball, Idaho Power Co, first vice president; and Thomas Ingledow, British Columbia Electric Co, second vice president.

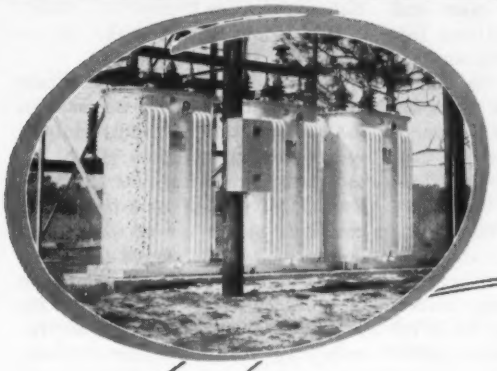
Newly elected to the Association's board of directors was Howard Wing, Westinghouse Electric Supply Co. Appointed to section chairmanships were M. M. Ilch, Idaho Power Co, Accounting and Business Practice; A. S. Gilbert, Idaho Power Co, Business Development; J. H. Steede, British Columbia Electric Co, Engineering and Operation; and W. E. Gordon, Portland General Electric Co, Personnel and Safety.

power transformers

Power transformer, OISC, 2,000 KVA, three phase, 60-cycle, 23,000 to 2,400 volts. Has four 2½% above and four 2½% below high voltage regulating taps with externally operated no load tap changer.

Power transformer, 1,500 KVA, three phase, 69,000Y to 480/240 volts. Hot spot temperature indicator and control, provisions for future forced air cooling, pedestals for mounting lightning arresters, low voltage terminal chamber and gas seal equipment.





When dependability is a factor...

Dependability in a transformer to you means trouble-free performance and long service life. To us, this means dependable construction.

For example, at STANDARD . . .

Tanks are built of rust-resisting steel, arc welded seams and tested under pressure. Liberal clearances are allowed from the windings and leads to tank and cover.

On the outside . . . attractive, long-wearing finishes with a primer coat and two finish coats of blue-gray enamel . . . on the inside, a lining of red oxide.

Covers are carefully and accurately fitted.

Tap changers and accessories efficiently placed with a specially designed tap changer switch.

These are just a few of the construction factors which STANDARD builds into Power Transformers. Look to STANDARD when you want dependability.

Everything Points To...

WRITE FOR BULLETIN CL-50

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REPRESENTATIVES IN PRINCIPAL CITIES

New Fast Depreciation Order for Kansas P&L

State PUC permits utility to use normalized taxes and credit actual deferral to tax reserve account. Similar to Kansas City P&L action

An accounting order which permitted the Kansas Power & Light Co to use normalized taxes and to credit the resulting deferral to a tax reserve has been issued by the State Corporation Commission of Kansas. The order was dated August 1.

This order follows substantially the same treatment prescribed by the Kansas commission with respect to an earlier order issued on May 16 in the case of the Kansas City Power & Light Co.

The commission in its order said that accelerated depreciation will "provide applicant during its periods of heavy expansion with a source of what may be termed 'interest-free funds'."

On any individual unit of property, the order pointed out, "the total tax liability over the life of such property may be said to be at least as great under accelerated depreciation as under the straight line method."

However, where the property of the the utility grows, then the total tax deferrals would become permanent savings within the financial structure of the utility.

Specifically, the procedure proposed by the company and accepted by the commission said:

"During those years of the service life of any of its properties which are the subject of accelerated depreciation pursuant to an election under the code, in which a deferral of federal taxes on income results from the use of the accelerated depreciation deduction in lieu of the deduction allowable under the tax depreciation method heretofore followed, to charge to operating income as a provision for deferred federal income taxes and credit to a reserve for deferred federal income taxes an amount or amounts in total for each year equal to such deferral of taxes. Such reserve accounts, as well as the applicable property accounts, will be kept by applicant so that each year's additions will be reflected separately therein, but showing also the cumulative effect for each year's additions.

"Commencing with the year in which its deduction of depreciation for federal income tax purposes in respect of any of its properties subject to accelerated depreciation," the order said, "is less than such deduction otherwise would have been if depreciation on such properties had been computed at rates consistent with its rates for like properties not subject to accelerated depreciation, and continuing until the reserve for deferred federal income taxes applicable to such properties is exhausted or such properties are retired from service, to charge to the reserve for deferred federal income taxes and to credit to operating income by appropriations from said reserve account an amount or amounts in total for each year equal to the increase in federal taxes on income resulting from such federal tax depreciation deduction."

It is of interest to note that the order further said:

"Applicant intends to elect to take accelerated depreciation pursuant to the code on very substantial amounts of additions to its utility plants. Although applicant has filed the 1954 and 1955 federal income tax returns computed by the use of the straight line method of determination of the depreciation allowance, it proposes to file amended returns for said years for refund of a portion of said tax for such years based upon the declining balance method in determination of allowance for depreciation (the approximate amount of such claims will be $47,677 for year 1954 and $209,308 for the year 1955). Applicant intends to continue from year to year to elect to take accelerated depreciation pursuant to the code."

Hawaiian Electric Cuts Preferred Stock Issue

Because of high interest rates, Hawaiian Electric Co cut back a plan to raise $5 million in a preferred stock issue, now seeks only $3 million instead.

Dillon, Read & Co and Dean, Witter & Co headed an investment group which offered 150,000 shares of 5½% cumulative $20 par preferred stock at $20 a share.

As another part of its fund-raising program, Hawaiian Electric also will issue 77,000 more shares of common stock. Stockholders will be allowed to subscribe on a 1-for-10 basis and, for the first time, will be allowed to oversubscribe in order to buy up stock not subscribed for by other stockholders. The firm plans to spend $41 million on expansion between 1956 and 1960 and has budgeted $7 million for 1956.

N. H. Utility Contests State Franchise Tax

A suit challenging the validity of New Hampshire's electric and gas franchise tax was taken under consideration by the State Supreme Court on September 18 after hearing two days of argument.

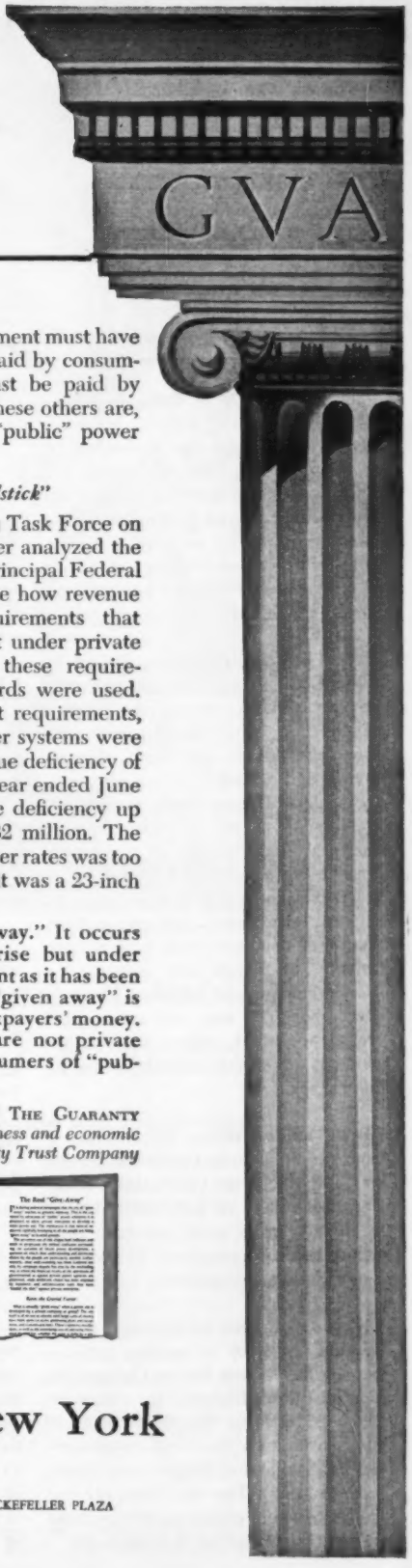
The case was brought by the Public Service Co of New Hampshire, which contends it should not be taxed on its franchise since the franchise has no value as such, inasmuch as it is not something that can be sold and it may be taken away by the state.

On the other hand, the state holds that an electric utility franchise does have a value and is a proper subject of state taxation.

Although the New Hampshire levy was enacted in 1931 it has never before been tested in the courts. During the state constitutional convention last spring an unsuccessful move was made to incorporate the franchise tax in the state constitution.

(*Continued on page* 166)

The Real "Give-Away"



IT is during political campaigns that the cry of "give-away" reaches its greatest intensity. This is the cry raised by advocates of "public" power whenever it is proposed to allow private enterprise to develop a water-power site. The implication is that natural resources rightfully belonging to all the people are being "given away" to favored groups.

Rates the Crucial Factor

What is actually "given away" when a power site is developed by a private company or group? The site itself is of no use to anyone until large sums of money have been spent for dams, generating plant and equipment, and transmission lines. These expensive installations, as well as the continuing cost of operating them, must be paid for, whether the work is done by a privately owned company or by a governmental agency. If the rates charged for the power are sufficient, and only sufficient, to meet the cost of operation and provide a fair and reasonable return on the invested capital, nothing is "given away." The users of the power pay, and the company receives, what the power is worth, neither more nor less.

Private companies and the investors in their securities pay heavy taxes, and their rates must include reimbursement for these taxes. Governmental agencies are largely exempt from taxation, as are the investors in their securities.

This creates the illusion that "public" power is cheaper than "private" power. The truth is that it is cheaper to the consumer but not to the people as a whole. It is cheaper to the consumer only because he receives the benefit of tax exemptions and other forms of subsidy which are not granted to the consumer of privately produced power. Since government must have its revenue, the taxes not paid by consumers of "public" power must be paid by others, which means that these others are, in effect, subsidizing the "public" power consumers.

The Power "Yardstick"

The Hoover Commission Task Force on Water Resources and Power analyzed the financial condition of the principal Federal power systems to determine how revenue compared with the requirements that would have had to be met under private operation. In computing these requirements, very liberal standards were used. Measured by these modest requirements, the principal Federal power systems were found to have a total revenue deficiency of nearly $76 million for the year ended June 30, 1953, and a cumulative deficiency up to that date of nearly $332 million. The Federal "yardstick" for power rates was too short by some 40 per cent; it was a 23-inch yardstick.

This is the real "give-away." It occurs not under private enterprise but under "public" power development as it has been and is practiced. What is "given away" is not natural resources but taxpayers' money. And the favored groups are not private power companies but consumers of "public" power.

From the September issue of THE GUARANTY SURVEY, *monthly review of business and economic conditions published by Guaranty Trust Company of New York.*
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N. H. Utility Contests

(*Continued from page* 164)

The tax is computed on the average state tax rate. Last year it was imposed at the rate of $46.60 per $1,000 of valuation.

Public Service Co protests that its tax has been increased from $89,600 in 1953 to $437,908 last year.

FINANCIAL BRIEFS

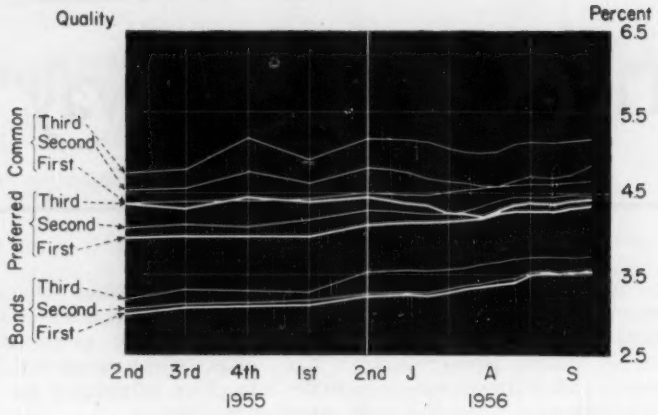
Public Service Co of Colorado directors have declared a 10% common stock dividend, payable November 16 to stockholders of record October 15. This is subject to approval by the Colorado Public Service Commission. The directors have also declared a regular quarterly common dividend of 45¢ a share, payable November 1 to stock of record October 15.

New Financing—Carolina Power & Light Co is planning to sell 500,000 common shares around the middle of October. This financing will take the place of the previously planned sale of $15 million in mortgage bonds . . . **Central Illinois Public Service Co** is planning to sell 170,000 common shares around October 23 . . . **Public Service Electric & Gas Co** is planning to sell $50 million in first and refunding mortgage bonds and one million shares of common stock with no par value. The bonds will be sold in November and the common early in December. The sales will be separate transactions and neither will be dependent upon the consummation of the other.

Middle South Utilities, Inc, has filed a registration statement with the Securities and Exchange Commission seeking registration of $200,000 of participations in its stock purchase plan for eligible employees of Middle South and its subsidiaries.

Illinois Commerce Commission had a hearing last week on a joint application by the **Illinois Power Co and the Central Illinois Light Co** for a transfer of certain electric properties between the two utilities. Involved are properties in Sangamon, Logan, and Tazewell counties. The two firms say the transfers would permit each to provide more efficient service to customers.

Today's Utility Yields (%)



	Bonds			Preferred Stocks			Common Stocks		
Quality	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Sept. 20	3.57	3.58	3.74	4.35	4.45	4.68	4.44	4.84	5.15
Sept. 13	3.55	3.51	3.73	4.34	4.46	4.66	4.42	4.73	5.10
Sept. 6	3.53	3.56	3.73	4.30	4.44	4.61	4.37	4.67	5.09

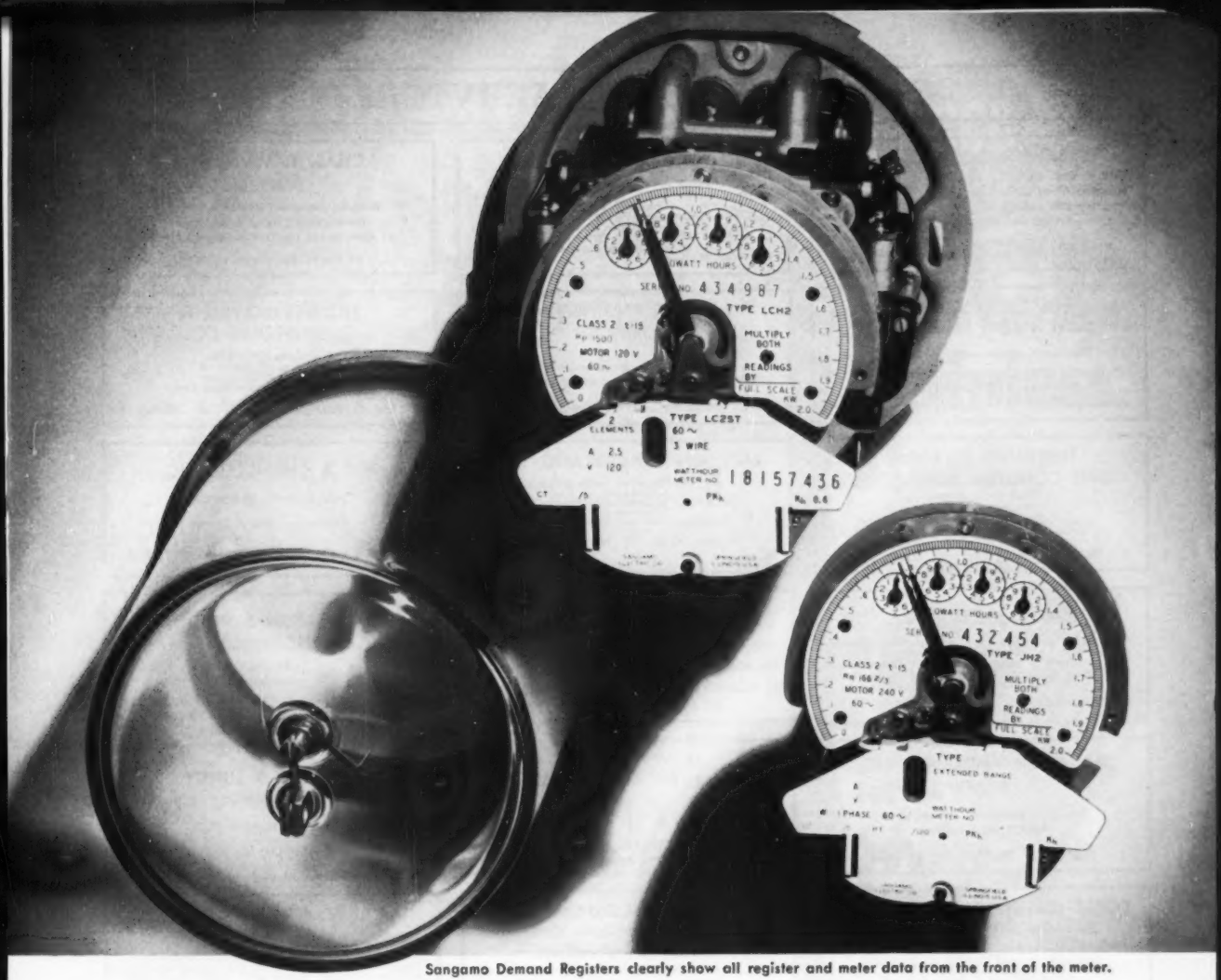
Utility Earnings . . .

Company	Period Months Ended		Net Income 1956	Net Income 1955	Earnings Per Common Share 1956	Earnings Per Common Share 1955
Alabama Power	12	August	$15,041,198	$13,638,751	$....	$....
Carolina Power & Light	12	August	9,924,904	8,710,434	1.72(a)	1.58(a)
Central Illinois Light	12	August	4,957,101	3,596,815	4.27(b)	3.10(b)
Detroit Edison	12	August	27,906,718	25,242,363	2.43(b)	2.34(b)
Georgia Power	12	August	14,851,436	13,619,676	....	....
Gulf Power	12	August	2,843,734	2,252,347	....	....
Houston Lighting & Power	12	August	16,700,684	13,900,958	2.79	2.31
Minnesota Power & Light	12	August	4,147,367	3,823,014	2.08	1.89
Mississippi Power	12	August	2,491,136	2,132,739	....	....
Mississippi Power & Light	12	August	4,450,162	4,022,757	....	....
New York State Electric & Gas	12	August	11,009,855	10,329,535	2.82(c)	2.88(c)
Oklahoma Gas & Electric	12	August	9,209,741	7,935,309	2.40(f)	2.20(f)
Sierra Pacific Power	12	July	1,211,070	1,146,422	1.59(b)	1.54(b)
Southern Canada Power	11	August	1,740,561	1,542,249	....	....
Southern Co, consolidated	12	August	29,053,754	24,968,210	1.48(h)	1.38(h)
Tampa Electric	12	August	3,805,760	3,309,356	1.56(g)	1.47(g)

Notes—(a) Based on 4,830,000 shares in 1956 and 4,600,000 shares in 1955; (b) Based on average shares; (c) Based on 3,337,475 shares in 1956 and 3,034,068 shares in 1955; (f) Based on 3,283,262 shares in 1956 and 2,984,783 shares in 1953, and (g) Based on 2,172,855 shares in 1956 and 1,975,323 shares in 1955; (h) Based on 19,594,946 shares in 1956 and 18,087,643 shares in 1955.

San Diego Gas & Electric Co. has asked California Public Utilities Commission approval to enter into a $15 million revolving credit agreement with six banks. Company will pay October 15 a quarterly common stock dividend of 24¢ a share as compared with 22¢ in the previous quarter to stockholders of record September 28.

A. E. Ames & Co is offering $25 million 20-year 4½% Series "O" sinking fund debentures of **Quebec-Hydro Electric Commission** at 98 to yield about 4.40%. The commission has estimated that it will require $250 million in "new money" in the next seven years to help finance the $495 million construction budget.



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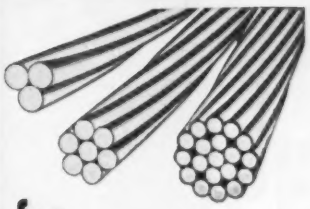

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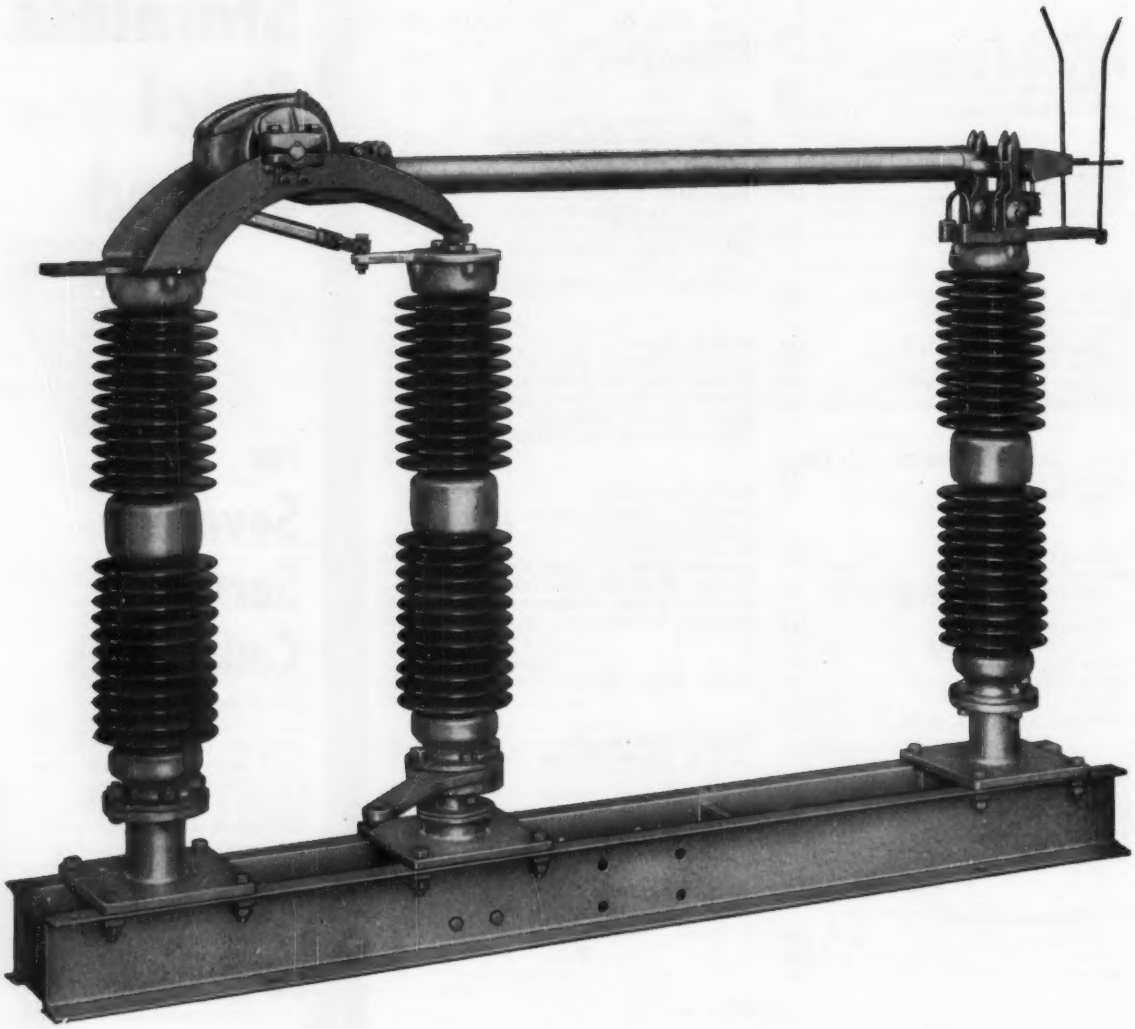

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